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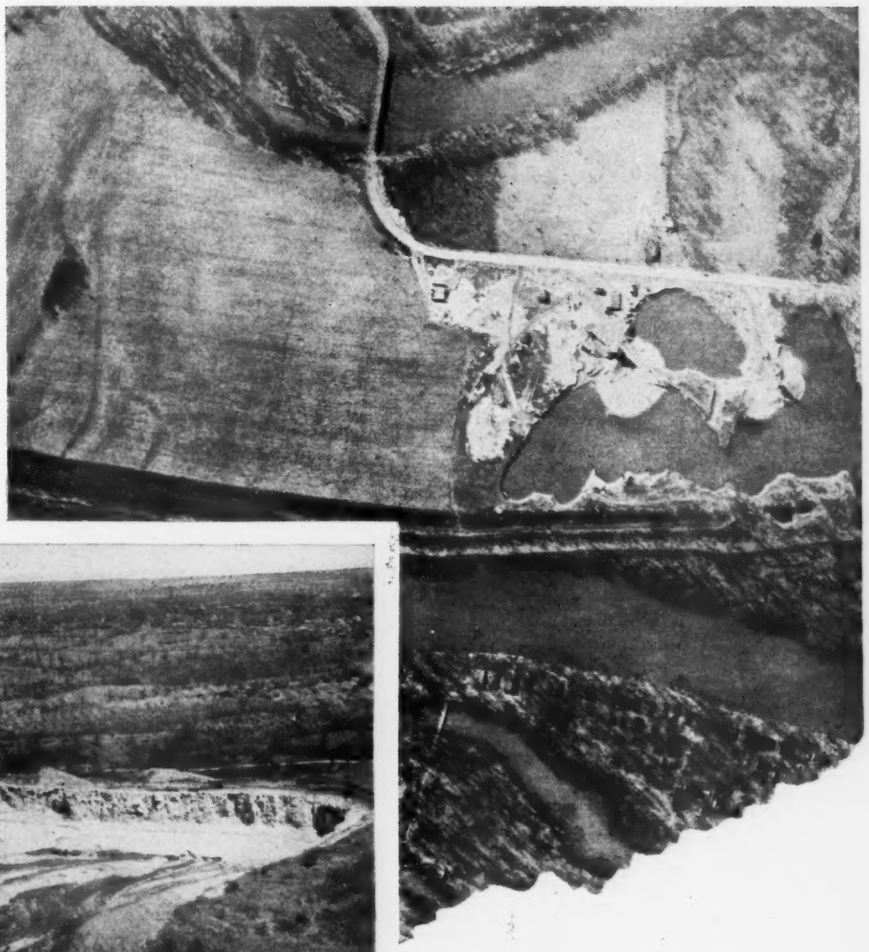
Aerial Photography in the Aggregates Industry

By Howard Maxwell
Maxwell Gravel Co., Indianapolis, Ind.

IT IS OFTEN HIGHLY DESIRABLE and sometimes imperative, to have accurate maps or sketches of gravel operations, construction projects, or sites for either, before operations are started. Maps showing the areas depleted by operation or the progress of construction are especially valuable.

The use of aerial photographs is highly practical for this purpose, as they can be made with absolute accuracy, and with less time and expense than by any other method. Photographs show details, such as the location of buildings, trees, roads and water lines, which are ordinarily not attempted in surveyed maps, due to the excessive cost of plotting in such objects.

Pictures of this kind are especially valuable as evidence in cases of legal dispute regarding plants or plant property. To be of most value for this purpose, they should



Above is a reproduction of a vertical photograph of the Maxwell Gravel Co. property and surrounding territory near Indianapolis, Ind. To the left is a bird's-eye view of the plant of the Ohio and Indiana Stone Co., Greencastle, Ind.

Oblique picture of plant of Indiana Portland Cement Co., Limedale, Ind.

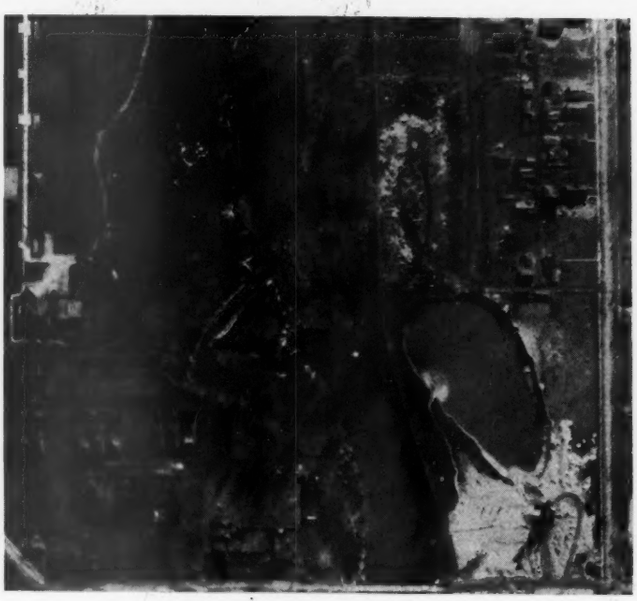
have the date and the name of the photographer appear on each print. If properly taken, their accuracy and reliability will be greater than that of a drawing.

Progress views of the construction or development of a property, taken from the air, will also serve as valuable historical records.

These pictures are classed as verticals, or mosaics, and are made by suspending the camera through a hole in the bottom of the airplane, and making the exposure with the camera level, and the ship at constant altitude. Any variation from this will impair the accuracy of the map.

In the early days of flying, when this type of photography was first made possible, it was thought that aerial work must necessarily have special equipment and the services of expert photographers who were specializing in this line. Since that time, however, flying has become a commonplace, and the ordinary commercial photographer, and even the adaptable and well-equipped amateur, will do this work when occasion requires. But for best results one must still call in the specialist.

In mapping areas of considerable size, it is customary to fly parallel strips, taking pictures fast enough to cover the area, and then assembling the prints somewhat in the manner of a picture puzzle. The area covered by each shot depends upon the scale desired for the map, and is governed by the altitude at which the plane is flown. Any number of shots can be made during a flight, as there are approximately 100 exposures in a roll, and the rolls can be easily changed in the plane.



Jones Gravel Co., Indianapolis, Ind.

Any amateur photographer has made "panoramics" with an ordinary camera, where the area he desired to cover could not be made in a single shot. Some of the general views of aggregate plants which I have seen in Rock Products I recognized as having been made this way, though many of them were so cleverly done as to appear like the work of a special panoramic camera.

The taking of photographs in sections from the air is much the same, except that it is complicated by the addition of another dimension, as well as by the movement of the plane.

In this type of work it is especially necessary that one

elevation be maintained, otherwise the sections of the "map" will be of varying scales and will not piece together accurately.

Comparatively small areas, such as gravel operations and quarries, are frequently covered by one or two exposures. It is desirable to make the pictures at the lowest possible altitude necessary to adequately cover the subject. In this way sharper detail is obtained and the airplane cost reduced due to climbing time saved.

An exposure made at 7200 ft. will show good detail, and using a camera of conventional size, will be an absolutely accurate map of approximately 260 acres, at a scale of 1 in. equals 600 ft. This map can be enlarged, however, to any scale desired up to 1 in. equals 200 ft., retaining all of its accuracy and showing better detail.

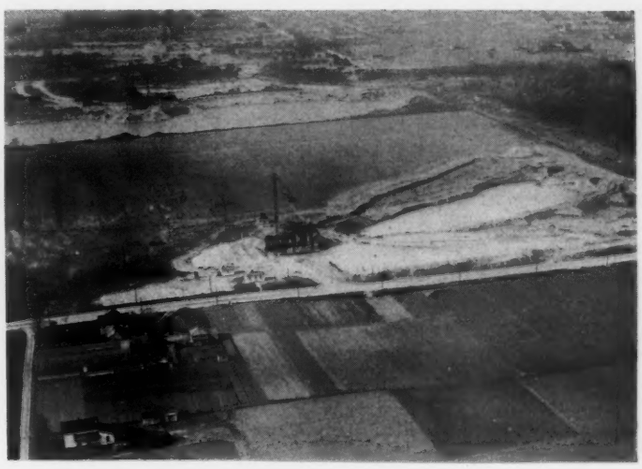
A wide-angle lens, or a small lens of good covering power used on a box larger than its designated size, will of course take in a larger field and make it possible to secure the desired map with a fewer number of shots. But in working in this way, care should be taken to work with a lens of known value and one that is absolutely dependable. The ordinary lens sold as "wide-angle" is likely to produce some distortion unless very carefully handled, and it is usually slower than a lens of ordinary coverage. In the use of a small lens with a large box, it should be tested out first with a ground glass to make sure that it will actually cover the larger plate, otherwise there will be black spots, or spots out of focus, at the corners of the print.

Oblique shots, or "bird's-eye views" are ordinarily made by holding the camera at an angle from the side of the plane. While these pictures are lacking in absolute accuracy, they make a much more interesting and distinctive photograph and are widely used in advertising.

The vertical pictures in this article are by courtesy of the Indianapolis Aerial Survey, and the oblique prints by Zinna Aerial Survey, also of Indianapolis, Ind.

Development of a new Indianapolis subdivision as seen from the air through the lens of a camera placed vertically

Note the distances covered in this view of a gravel plant in eastern Illinois



Definition of detail characterizes this view of the plant of the State Gravel Co., Indianapolis, Ind.

Economics of the Non-Metallic Mineral Industries*

Part I—Introduction—Value of Prospects and the Factors That Enter Into That Value

By Raymond B. Ladoo

THERE ARE SO MANY MISCONCEPTIONS of the economic position of the non-metallic mineral industries—and in this group are not included coal and petroleum—that it seems worth while to outline some of the fundamental factors in production, preparation and sale.

There is a tendency for many people to consider the non-metallics in a field entirely apart from the metals and another tendency to consider the two groups identical from an economic viewpoint. Both views are correct in part and wrong in part. These misconceptions have resulted in the failure of many new enterprises which really should have succeeded; in the wasting of much money on improper lines of investigation, development, production and sale; and in the improper location of new plants.

The non-metallics resemble the metals in that they are natural mineral products; the deposits are irreplaceable wasting assets; they are all won from the ground by mining or quarrying operations which are or may be nearly identical; similar methods of crushing, grinding, screening and concentration are used in both fields. The chief differences are twofold and out of these differences arise many others.

Fundamental Differences Between Metal and Non-Metal Operations

First, most non-metallic minerals are prepared for ultimate use either without any chemical change in their constituents, or if changed chemically they are not reduced to simple chemical elements of fixed and definite physical and chemical properties. Metallic ores, such as copper ores, are melted and refined to metals of definite purity and with definite properties. Copper is copper wherever or however it is produced. But no two talcs are exactly alike, nor are feldspars, gypsums, limestones or marbles; and they cannot be made exactly alike.

We never ask if a certain copper ore can be melted to produce a copper of given characteristics. We know it will produce a standard copper of commerce—perhaps not easily or economically, but it can be done. But we do ask, or should ask, if a given garnet ore can be milled to produce an abrasive garnet acceptable to the trade. If the structure and hardness of the garnet is wrong, it is worthless; nothing can be done about it. Not all mica or asbestos is economically valuable, even if it is mineralogically pure. The asbestos fibers may be coarse and stiff and brittle and the mica may be cracked and wavy.

Photo by Blank & Stoller, Inc.

Raymond B. Ladoo

If high grade and low grade copper ores are badly mixed up in a large deposit it makes no difference, if the average quality is high enough to pay to work. They all will make one kind of copper. But mixed-up deposits of many non-metallic minerals cannot be averaged. There is often no average grade acceptable to the trade. The good must be carefully selected from the bad or left alone.

Fundamental differences in the physical and chemical properties of the same mineral from different deposits give rise to different values. The brass manufacturer of Connecticut doesn't care whether his copper comes from Bisbee, Arizona, or from Brigham, Utah, as long as the delivered price is the same. But the graphite crucible maker is vitally concerned whether he gets Ceylon or Madagascar or Alabama graphite. Diatomaceous earth is found in many states in the East but the sugar refiner cannot and will not use it; he wants a certain grade of California diatomaceous earth and will pay to get it.

"Place Value" the All-Important Consideration

The second major difference is that of abundance and value. Most non-metallic minerals are relatively abundant and widely distributed. Their values per unit are low and freight charges are often higher than the values of the products. Thus "place value" becomes all important. A large deposit of copper ore in the Belgian Congo, in the Chilean Andes, or in the heights of the Rocky Mountains is valuable and workable; but a large deposit of feldspar in the mountains of northern Idaho, or in central Utah, is of little or no economic value, at least at present. A large deposit of limestone and shale suitable for making portland cement, located on Staten Island in New York harbor would be very valuable; but the same deposit located at Tonopah, Nevada, would be of no interest.

Upon these two fundamental differences are based the different economic positions occupied by the two groups of industries. From the consideration of unworked deposits through to the marketing and use of the finished products the two groups must be studied and treated differently. From a purely engineering standpoint the groups may parallel each other closely; similar methods of mining and quarrying may be used, similar methods of transportation may be followed and the same or similar crushers, grinding equipment, screens, conveyors, etc., may be adopted.

From the mechanical standpoint many non-metallic mineral industries could well profit by closer contacts with and closer study of metallic ore mining and concentrating practice. But on the economic or business side this parallelism does not and should not exist. Many mining engineers and operators experienced only in metal mining fail to realize this economic difference. Reputable consulting engineers when attempting to deal with non-metallic mineral problems often make the most astounding mistakes in

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General Outline of This Series

1. Introduction.
2. Value of prospects.
   - A. Geographic importance (place value).
     - a. Markets.
     - b. Transportation.
     - c. Climate.
   - B. Commercial value of deposits.
   - C. Quality of deposit.
   - D. Summary of valuation factors.
   - E. Financing.
3. Marketing.
   - A. Finding markets (surveys).
   - B. Servicing markets.
   - C. Cost of sales.
   - D. Sales method.
     - a. Jobbers and agents.
     - b. Own salesmen (full line men or specialty men).
   - E. Selling ultimate consumer versus selling to manufacturer who uses as raw material.
   - F. Trade marks and brand names.
   - G. Traffic.
4. Transportation.
   - A. Influence of transportation on value of prospect.
   - B. Long hauls (rail, water, truck).
5. Small versus large companies.
6. Combinations.
   - A. Advantages and disadvantages.
   - B. Types of combinations (horizontal and vertical).
   - C. How combinations are formed (by producers, promoters, consumers or bankers).
   - D. Data required (appraisals, records of earnings, good will, etc.).
7. Type of products to be made.
   - A. Diversity of products and influence on size and stability of company.
     - a. Markets all in same industry (such as building materials).
     - b. Markets in diverse industries.
     - c. All products from one raw material or from several diverse raw materials.
8. Research and development.
   - A. Need for accurate data in sales work today (change in type of purchasing agents).
   - B. Technical development versus true research.
   - C. Technical development and fact finding.
     - a. Data on machine performance, process control, etc.
     - b. Standard tests, grades and analyses.
   - D. Plant, product and process development work.
   - E. True research.
     - a. Fundamental properties of raw materials and of combinations of diverse raw materials.
     - b. Systematic research versus trial and error methods.
     - c. Group research.
       - (1) Associations
       - (2) Government bureaus.
       - (3) Universities and endowment institutions.
     - d. Company research.
9. Overproduction and surplus capacity.
   - A. Obsolete plants and equipment.
   - B. Changes in centers of population, markets, freight rates, transportation methods etc.
   - C. New products, methods and processes drive out old.
   - D. Reluctance of producers to change their line and make new products. (Follow customer, whatever he needs. Sell him what he wants, not what can be made easiest.)
   - E. Divergent views of production, research and sales departments on meeting customers' needs and wants.
   - F. Large variety of products versus a few standard products.

their judgment of the economic side of their problems.

"Horrible Example" of Lack of Sound Judgment

To cite but one of many examples, a few years ago a large firm of eastern consulting and appraising engineers, highly regarded by the large banking interests of New York, made an extensive study of a non-metallic mineral project. The property was very carefully surveyed and examined. Many core drill holes were put down and each core studied and analyzed. Detailed estimates of tonnage were prepared. Large size samples were taken and on them semi-commercial preparation and concentration tests were made. Costs of mill construction, mill recoveries, milling costs, etc., were figured in detail. Market prices over a period of years were shown and profits on a mill handling 2000 tons of ore per day were estimated. Maps and charts were printed in colors. Finally an elaborate report bound in leather was submitted recommending the project. It is probable that $15,000 to $20,000 or perhaps more was spent on this piece of work.

The report was submitted to large banking interests for financing, but eventually nothing came of it. Why? Because the total demand for the finished product amounted to only a few hundred tons per year. The high price was due to very small scale operation by a single producer, not to any fundamental scarcity of the mineral. No new uses or markets were suggested in the report.

Extensive research and market development over a long period might gradually have developed fairly large scale markets, but even this was doubtful. Furthermore, if such markets were developed, there was nothing to prevent other people going into the same business and cutting prices down to a point where there was little in it for anyone. A simple study of markets at the outset would have revealed this condition and saved many thousands of dollars. If such a large and well established firm of engineers and appraisers made this mistake can we wonder at the dozens of similar ill advised projects which are started each year?

Economic Study in Specific Terms

We may reduce this economic study to more definite terms if we attempt to divide some of the non-metallic minerals into groups of similar characteristics. This can be done only roughly as, in the end, each industry has its own unique problems.

The following groups are suggested as a basis for discussion.

GROUP I — Minerals whose "place value" is paramount. Here belong the low-priced, relatively abundant minerals, sold in bulk in large volume:

Cement materials	Salt
Clays	Sand and gravel
Dolomite	Silica (low grade)
Gypsum	Slate
Limestone	Stone, building
Marble	Stone, crushed
Mineral fillers	

GROUP II—Minerals whose physical and chemical characteristics are paramount:

Garnet (abrasive)	Cryolite
Gem stones	Diaspore
Graphite	Diatomaceous earth
Kyanite	Fluorspar
Lithium minerals	Potash salts
Mica	Pumice
Monazite	Sillimanite
Andalusite	Strontium minerals
Asbestos	Sulphur
Bauxite	Talc
Borax	Tripoli

GROUP III—Minerals for which specifications are very rigid, but where "place value" is also of great importance:

Barytes	Magnesite
Bentonite	Phosphate rock
Feldspar	Pyrophyllite
Fullers earth	Stone, fluxing

Obviously there is some overlapping between these groups for each mineral must be subdivided into various types suitable for various uses. For example sheet mica suitable for electrical purposes is far more valuable and occurs much less abundantly than natural scrap mica or mica schist suitable for making the various types and grades of ground mica. Hence "place value" of scrap mica or mica schist is more important than for sheet mica. All minerals, of course, have some "place value."

It is evident that the less the distance and the lower the freight costs to principal

markets, other things being equal, the more valuable is the deposit. Good deposits of metallurgical grade fluorspar near Pittsburgh, or of feldspar near East Liverpool, Ohio, would be much more valuable than similar deposits in central Nevada. On the other hand in the "place value" group physical and chemical properties are always important. In spite of the fact that sand and gravel are very abundant almost everywhere they must be made to conform to certain standards before they can be successfully marketed.

Commercial Value of Non-Metallic Mineral Deposits

From the preceding discussion of the economic features of this field it is evident that most deposits of non-metallic minerals must be examined and appraised on a different basis than metallic ore deposits.

In the first place markets for most non-metallics are more important than deposits. If you have a million pounds of ingot copper on hand you are sure it can be sold without much effort, through established sales channels, at the standard market price, within a reasonable length of time; or if the time is not opportune you can go to a bank and borrow money on it. But if you had five thousand tons of ground feldspar in bags in your warehouse, and no established trade, you would have a hard time to dispose of it, even at bargain prices, and it would take you months to do it. If you couldn't sell it quickly enough there is little you could do about it. No conservative and well informed banker would loan you money on it. Users of feldspar settle on certain well established sources where they can get the same uniform products over a long period. They adjust their formulas and their manufacturing methods to fit one particular feldspar and are very reluctant to change even at a considerably lower price. Even if they should be willing to change there would be a long period of laboratory, semi-commercial and full commercial scale testing, changing of formulas and so on before they would begin to use the new spar regularly; and when they did finally accept it, they would order it out as needed and the 5000 tons might last them for several years.

Available Markets All Important

Each industry, of course, has its own marketing problems (marketing will be discussed later), but in nearly all of the industries under discussion the same or similar situations prevail. *There are no free, unrestricted markets for the non-metallic minerals.* The location of suitable markets then should come first and the finding of the deposit of raw materials should follow. Given a market for 15,000 tons of feldspar a year and we can rather easily locate a source for that feldspar. But given a deposit of feldspar, let us say in Arizona, and a mill capable of producing 15,000 tons per year and we would hesitate a long time before trying to market the output. The situation is the reverse of that of the metals.

Next to the proving up of the existence of suitable markets stands the geographical location of the deposit and its relation to the location of the markets, in other words "place value" again. We must study distances from principal markets and probable freight rates to those markets compared with freight rates from established producing plants. We want to know whether the deposit could be served by more than one railroad, what railroad equipment would be available, what car switching service could be had, and so on. Can important markets be reached by motor truck deliveries? Should the mill be located at the deposit or in an important market center and the raw material be brought to the mill? Can water transportation be used advantageously? The transportation question is a large problem in itself and will be discussed more fully later.

The largest non-metallic mineral industries, in point of tons of raw material produced, as well as of annual value of output, deal chiefly with building construction and road making. These include portland cement, lime, crushed stone, sand and gravel, gypsum, heavy clay products, building stone and slate. Nearly all building and much road construction have important seasonal fluctuations, due to cold weather and snow in the north and rain in the south. The industries which supply the raw materials, then, experience similar fluctuations in demand for their products. Since most of these materials are produced from open quarries climatic conditions have much to do with the costs of operation and even with their ability to operate at all during certain periods. In some of the most northern states portland cement plants practically close down during the winter months, due both to lack of market and to difficulties of plant operation; while in the extreme southern states seasonal fluctuations are much less marked, or practically absent.

(To be continued)

Metals Liquid—Non-Metals Not Liquid—Assets

DR. BENJAMIN M. ANDERSON, economist for the Chase National Bank, New York City, in a recent address, in describing some of the mysteries of the gold standard, made quite clear the distinction that Mr. Ladoo makes in this article between a standard metal mineral like copper, gold, etc., and the locally marketed non-metallic mineral or rock product. Dr. Anderson is quoted thus: "Gold is merely the most liquid asset. There is a hierarchy here. Other commodities, easily standardized and of recognized grades, with wide international markets, which can always be sold at a price, even if not always at a satisfactory price, are likewise liquid. Real estate stands very low in the scale ordinarily, and an entailed piece of real estate obviously is not liquid at all. Marketability, salability, liquidity, are the heart of the problem of bank credit. A money market needs less gold reserves to the extent that it builds its credit upon other readily marketable things."

New Louisiana Plant of Gifford-Hill and Co.

ACCORDING to J. H. Wilson, superintendent of the Gifford-Hill and Co., the new gravel pit at Searcy, La., should be in operation around April 1. Mr. Wilson, who was sent here from Dallas, Tex., has been at work for several weeks with a crew of around 40 men building the local unit, which will be one of the most complete in north Louisiana.

The Gifford-Hill and Co. have a total of 10 pits, three of which are located in Louisiana, and are considered one of the largest producers of gravel and sand for road building and construction purposes in the South.

The Searcy pit, when completed, will employ around 50 men at all times and Mr. Wilson says local labor will be used wherever possible. Approximately $15,000 will be spent on the new pit and the monthly payroll is expected to run between $4,000 and $5000. The police jury has consented to build a new road into the pit and the gravel will be furnished by the Gifford-Hill Co.

The opening of this new industry will mean much to local business as operations are expected to continue over a period of years.—*Jena* (La.) *Times.*

Mexican Cement Companies in Merger

THE FORMATION of Cementos Mexicanos, S. A., with a capitalization of 4,400,000 pesos Mexican gold, has just been completed by the consolidation of Cementos Hidalgo, S. A., and Cementos Monterrey, S. A., the two largest cement-manufacturing companies in Mexico.

Juan F. Brittingham, capitalist, who introduced cement into Mexico in 1904, was the moving spirit of the merger and is chairman of the board of the new company. Lorenzo Zambrano, banker, is president. Other officers and directors are F. F. Niggli, American banker; Matias Elizondo, industrialist, and Mariano Hernandez, capitalist.

The new company will manufacture portland cement, for which there is a large demand because of the many dam and road-building projects now under way in Mexico. It expects to produce the major portion of the cement used in Northern Mexico. Fifty per cent of the stockholders are Mexicans and the balance are Americans, Spaniards and Britishers.—*Los Angeles* (Calif.) *Times.*

Quarry Practice at the Operations of the John T. Dyer Quarry Co.

At Monocacy and Clingan Operations This Company Employs Novel Blasting Method

New crane handling stockpile material at Monocacy plant

THE JOHN T. DYER QUARRY CO. has three plants, all near Birdsboro, Penn. They are referred to as the Monocacy, Clingan and Trap Rock plants. This arrangement also is in order of their capacities, the first being by far the largest, with a capacity greater than the other two combined. The Monocacy plant is capable of crushing, screening and washing 2000 tons of trap rock per 8-hour day.

One of the First Quarries to Use Motor Trucks

The smaller operation at Trap Rock, years ago, used teams to haul the stone from the quarry to the plant, but when motor truck transportation was being thought of as practicable for quarries, this company tried out the idea there with eminent success, and was one of the first (if not the first) crushed stone operator to use trucks in quarries. In the July 7, 1928, issue of ROCK PRODUCTS was published an article showing the savings that were made, and other data relative to quarry haulage by truck.

In studying the older published descriptions of the plants of this company and comparing them with present general practices, now common in the crushed stone industry, one is struck by the number of "FIRSTS" that this company adopted early, or in some instances originated.

Apparently it was among the first to wash crushed-stone aggregate. It was among the first in the East to use tunnel blasting methods. It was among the first to equip railroad type shovels with traction wheels, and to use small revolving shovels for loading. Its primary crusher was at one time the largest in the world and still is larger than most jaw crushers in the industry. Today this company is taking the lead in developing blasting technique; and it is leading in the solution of the problem of preparation and marketing of trap-rock fines.

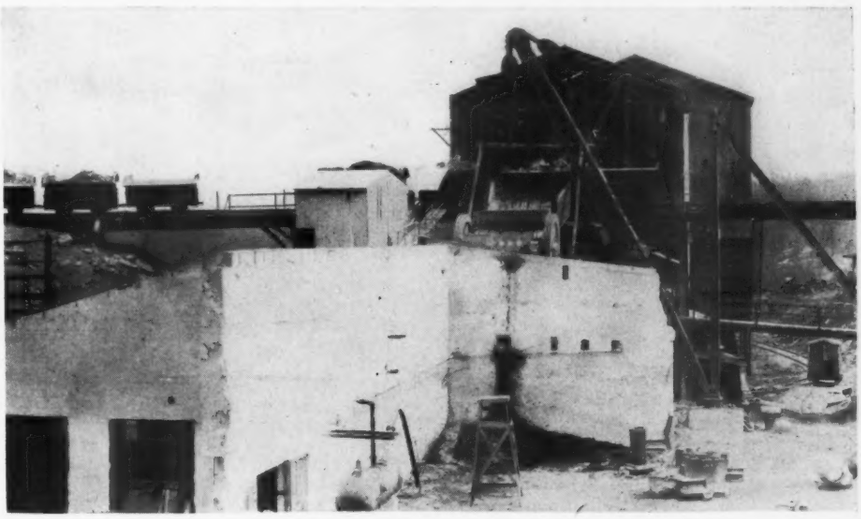
Monocacy Operation

In the October 4, 1924, issue of ROCK PRODUCTS a description of the Monocacy operation was published; there have been no radical changes of note. This plant was then owned by the Birdsboro Stone Co. The changes that were made apparently have been of such a nature as to increase production or to increase the cleanliness and accuracy of size of the aggregate. These, of course, entailed additional equipment and changes in the construction details.

A Veteran Crusher—And an Unusual Drive

So many different manufacturers have supplied replacements in the many years of the original Power and Mining Machinery Co.'s 60- by 84-in. jaw crusher's operation, that only the original "idea" can be said to remain. The Traylor Engineering and Manufacturing Co. recently supplied the crusher with a new set of side plates, replacing the last castings that were part of the original machine.

The drive for this crusher, and of the 30-in. McCully gyratory, has been changed and is unusual. Formerly, the crushers were driven by a 500-hp. General Electric, 2200-v., induction type motor, through a belt drive. This motor is still kept in its original position and is used for starting and getting the crushers up to operating speed; then the load is switched to a new 500-hp. General Electric synchronous motor that carries the operating load. This synchronous motor is belted



Primary crushing plant at Monocacy

to the same extended shaft as the induction motor.

A detailed description of the quarry and plant follows in another place in this issue, so only a few high points will be touched on here, that are not referred to in the other article.

Unusual Blasting Practice

At present plans are being developed for a departure from regular tunnel blasting practice that will eliminate some of the hazards and expense involved in driving coyote tunnels for shooting down the upper half of the quarry face.

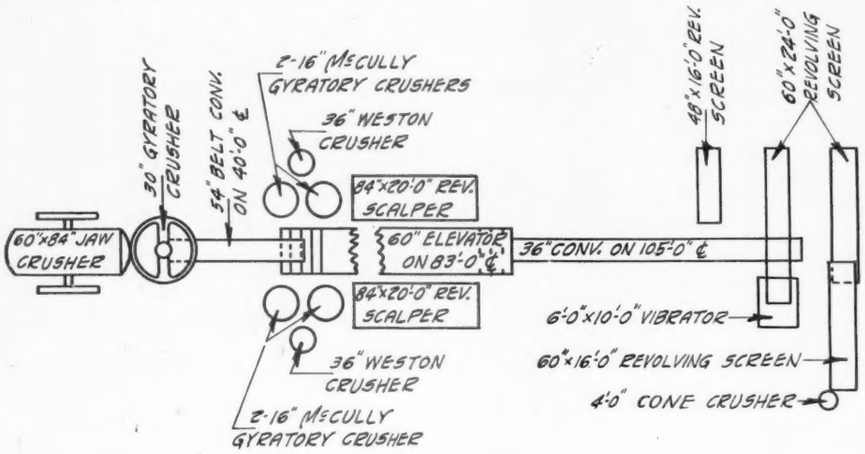
The two coyote holes for the last blast set off on April 30, 1930, had adits half-way up the quarry face, so that getting supplies to the men driving the tunnels, loading the dynamite and stemming the powder pockets was conducted under difficulty. Either the men had to carry the supplies up the steep face or they had to be lowered to them over the quarry rim. The original idea of driving tunnels half-way up the face was to shoot the 310 ft. vertical face in two benches, first knocking down the upper half, and when this shot had been loaded and cleaned up from the quarry floor, to shoot the lower half. This program will be continued, but the tunnel-driving methods will be radically altered.

To carry out the new program, a vertical shaft was driven to a depth of 150 ft. and about 150 ft. back from the quarry face. At the bottom of the shaft a drift was run towards the quarry for a distance of 100 ft. where a cross-cut was started that practically parallels the quarry face. This cross-cut will run the length of the quarry, keeping back from the face a distance of approximately 50 ft. through its entire length and will constitute the powder pocket for the first blast in this new program. Similarly, starting from the main drift, but 100 ft. back from the quarry face, a second cross-cut will be run which will be the powder pocket for shot No. 2 and again at the bottom of the shaft the third cross-cut will be driven for shot No. 3.

For shooting the lower half of the quarry, seven coyote tunnels have been driven into the face at regular intervals and with cross-cuts at their ends so that the blasting program will be, first, to shoot upper shot No. 1, then lower shot No. 1, followed later by upper shot No. 2 and then lower shot No. 2, carrying out this procedure indefinitely.

The shaft used for the development of the upper pockets is 5 ft. in diameter and is cased with an old piece of steel pipe for the upper portions, with the pipe extended above the surface to prevent loose rock from slipping into the shaft.

A temporary stiff-leg derrick using a Flory hoist driven from a 25-hp. General Electric motor through a Link-Belt, silent-chain drive is used to hoist the rock removed from the main and cross drifts. A 12-in. by 14-in. Ingersoll-Rand compressor was also installed at the shaft to supply air to the jackhammers that are used for driving the underground passageways.



Flow sheet of Monocacy plant

Making Stone Sand for Coal Separation

Another innovation at this plant is the method of treating the fines, making a sand that will be used in the recovery of fine coal from debris incidental to the mining of the coal in the Pennsylvania anthracite fields.

At the coal washer the finely divided rock dust is made into a slurry that has a specific gravity greater than the coal; hence when the two are mixed, the smaller particles of coal float on top of this slurry and make a separation possible.

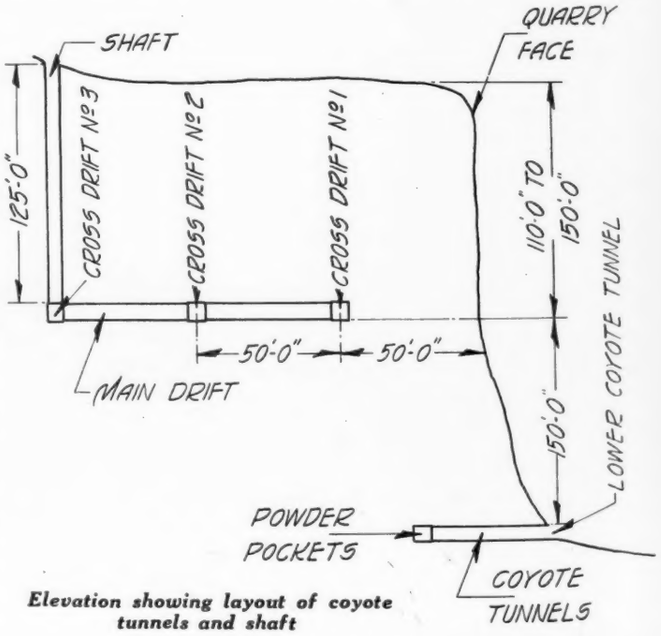
At the Monocacy plant, for the preparation of this fine trap rock dust, a Lewistown Foundry and Machine Co.'s 9-ft. chaser mill has been installed, similar to those used in the preparation of washed silica sands.

The mill consists of two cast-steel wheels that ride on a steel ring. The crushing is done between the ring and wheels. A suitable plow or scraper throws the material under the revolving wheels and when the product being ground is sufficiently fine to pass the screen that is part of the base, the fines flow to either of two screens, one located on each side of the pan grinder. These screens revolve about a horizontal shaft with the screen cloth fixed to the periphery of the drums. The ground material is fed to the inside of the screen, which is so constructed that any oversize falls back to the grinding pan as the screen revolves.

The fines from the screens fall to the lower end of two parallel, inclined, 16-in. spiral conveyors, with fresh water added at the high end of the screws, so that by the time the fine sands are carried up to the high end and discharged, they are washed clean and ready for shipment. The screws are about 16 ft. long, placed side by side, inclined at 20 to 25 deg. from the horizontal, and are all driven at the upper end by suitable pinion gears from a separate 5-hp. motor. These screws are 16 inches in diameter and rotate at 18 r.p.m., and are made of wrought iron. The chaser mill normally requires 30 to 35 hp. to operate.

Novel Stockpile Methods

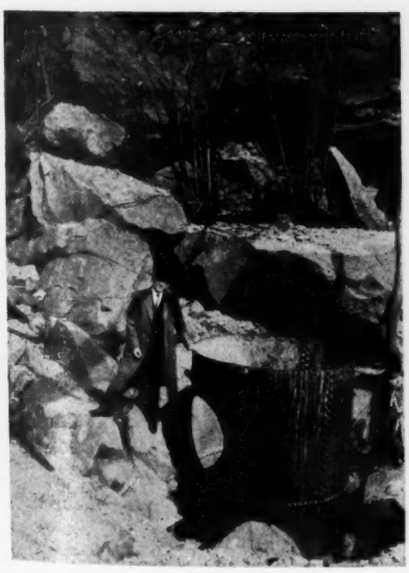
At the stock piles about 2 miles below the plant, a new crane of novel construction was built in 1930. This crane is mounted on a movable structure 35 ft. high, having a span of 35 ft. with the Brownhoist and



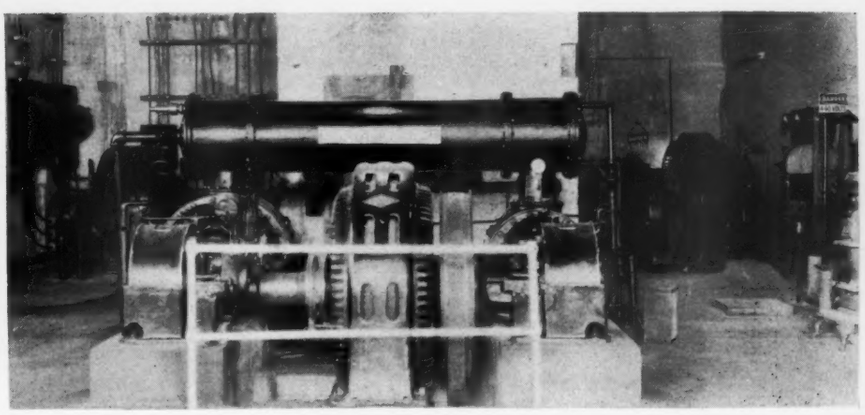
Elevation showing layout of coyote tunnels and shaft

VIEWS AT MONOCACY PLANT—In above illustration is marked the location of adits to coyote tunnels

In the building in foreground are the screens mounted over steel bins



Shaft collars and derrick



Air compressor and power station

its drive motors resting on the platform above. A standard-gage switch runs between the two legs of the structure, so cars with stone for stockpiling are run under the crane and unloaded by the 5-yd. Blaw-Knox clamshell bucket.

By this method of stockpiling and reclaiming, the storage pile capacity is greatly increased. The necessity for a large stock pile is indicated when it is considered that the plant is often called upon, on short notice, to ship a hundred or more cars at a time.

Motor Schedule

Following is a motor schedule showing the horsepower and makes of the different drive motors in the plant at Monocacy:

Primary and 30-in. secondary crushers—500-hp. General Electric synchronous.

Four gyratory crushers—150-hp. each, Ideal.

Scalpers—40-hp. General Electric.

60-in. bucket elevator—150-hp. Ideal Electric (silent chain drive).

Compressor—210-hp. Electric Machinery Co.

48-in. cone crusher—150-hp. Westinghouse.

Screen countershaft—75-hp. General Electric (2).

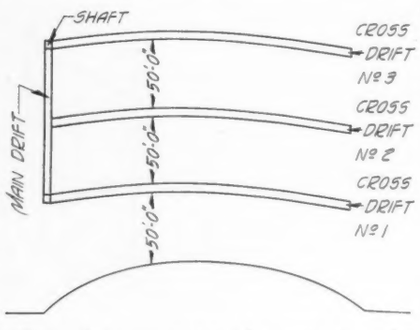
A complete report on operating costs, etc., by Joseph A. Conway, follows this article.

Clingan Plant

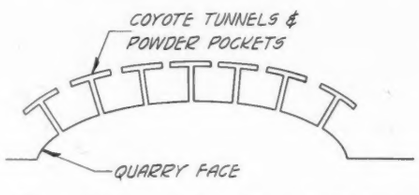
Not many crushing plants, especially a plant handling a hard and tough trap rock, can go through 19 years of practically continuous operation and with the exception of a few additions, new installations and changes in practice, retain a great portion of the original equipment and at the same time rank as an economical operation and with many more years of useful life ahead; yet the Clingan plant has gone through that period of successful operation and while the management has made changes to keep step with modern practice, the plant, in general arrangement, is as originally designed.

Most of the changes made at the Clingan plant in the past years might be said to be basic, including changing from small diameter drill holes to well drilling; from hand loading to power shovel loading; from industrial car and cart transportation to truck transportation and from the use of a steam engine as the prime mover to electric motor drives, etc.

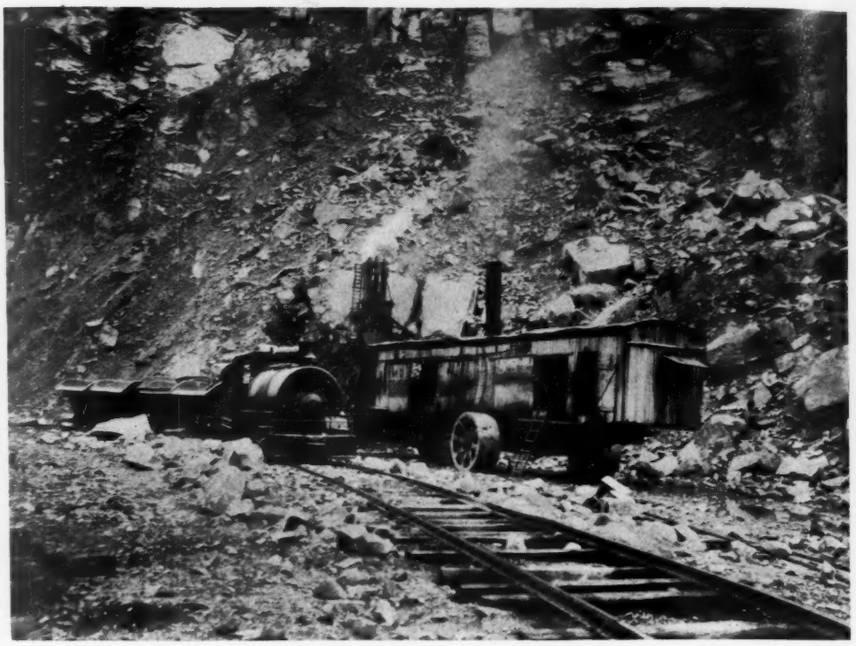
The original equipment for the plant as built in 1911 was supplied by Farrel-Bacon, Inc., now Earle C. Bacon, Inc., and the crushing and screening plant still retains the equipment originally installed, with additions, however, of some other items that were made within the last few years. The old equipment is still in first-class shape and from general appearance it too might have been installed only in the last few years, showing what good material to start with, plus reasonable care and good management, can do in the way of keeping a plant operating over a long span of years.



Plan of upper series of coyote tunnels



Plan of lower series of coyote tunnels



Loading stone after the blast

Crushing

The original Clingan plant was designed for hand loading using jaw crushers, the original 36-in. by 18-in. Farrel-Bacon crusher being augmented by a second jaw crusher of the same size and make, and later by a third jaw crusher, 42-in. by 26-in. also of the same make as the original crusher. These crushers, all placed in a single row, are located so that trucks or carts can dump to them direct. The crushers are set to discharge a 3-in. product, which falls to a 36-in. belt conveyor serving two 5-ft. by 10-ft. Farrel-Bacon rotary scalping screens using manganese steel plates and having 3-in. round perforations. These plates last from three to four seasons.

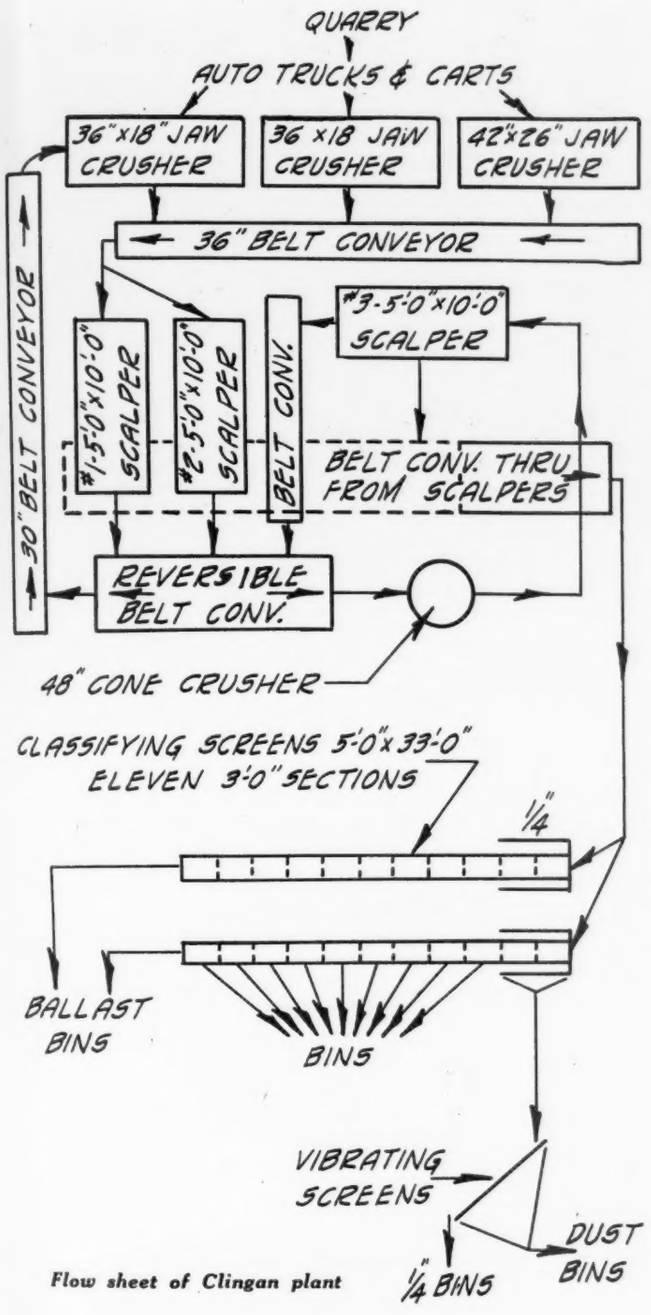
Originally the scalping screens' oversize discharged to a short reversible belt conveyor, which in turn fed a 30-in. belt that returned the plus 3-in. to one of the smaller primary jaw crushers. With demands for increased capacity and changes in size requirements, two years ago a 48-in. Symons cone crusher was installed, which is so located that the short reversible conveyor could serve either the cone crusher or the old jaw crusher; thus in the event that either of these two essentially secondary crushers should be out of commission, either could be used separately and production maintained. This plant operates dry.

Screening

The discharge product from the 48-in. cone crusher falls to a recently installed 48-in. by 10-ft. Link-Belt scalping screen having 3-in. perforations also. The oversize from this scalper falls to a fourth belt conveyor that delivers the oversize back to the short reversible conveyor, so that the product can be passed through secondary crushers again.

The fines from all three scalping screens fall to a 36-in. belt conveyor that delivers the material to the two Farrel-Bacon rotary sizing screens. The belt that was in service at this place, prior to the belt that is now in service, had an interesting and long life, interesting solely on account of the fact that part of the belt was in service for 16 years. We regret that we are unable to say whose belt it was except that it was supplied along with the original equipment. The belt is driven by a 35-hp. Westinghouse motor. All of the motors have push-button controls.

The rotary sizing screens are 5 ft. in diameter and have eleven 3-ft. sections making up the main barrel, with an 8-ft. dust jacket of ¼-in. wire cloth. These two



Flow sheet of Clingan plant

screens are driven by a 75-hp. motor through two Link-Belt silent chain drives, a drive which has worked out very successfully. The material from the dust jacket of the two rotary screens falls to two Hummer screens that separate the dust or screenings from the ¼-in. material. The screening equipment produces the following sizes: Screenings, ¼-in., ½-in., ¾-in., 1-in., 1¼-in., 1½-in. and ballast. The latter product is from 1½-in. to 4-in.

The original plant was steam driven but gradually the various units have been changed to electric drives, in some instances with individual motors, but with some portions of the plant still driven from the original line shaft by a 300-hp. Westinghouse synchronous motor through a Texrope drive. This motor drives the two smaller jaw crushers, the scalping screens and the four conveyors in the crushing plant proper. The 42-in. by 22-in. Farrel-Bacon crusher is driven by a separate 200-hp. Allis-Chalmers motor through a Link-Belt silent chain drive. The cone crusher also has a separate drive using a 200-hp. Westinghouse synchronous motor. This high horsepower requirement for the cone crusher is attributed to the hardness and toughness of the rock crushed; a 100-hp. motor was first tried, as recommended, but did not prove satisfactory.

One of the three original 150-hp. fire-tube boilers is still used to operate the steam pumps that supply what water is necessary for the water cooling of crusher bearing, for the steam shovels and miscellaneous uses, but these will soon be dispensed with and electric-motor driven pumps installed.

The products from the sizing screens fall to wood bins from which cars can be loaded direct for shipment over the Pennsylvania railroad or to trucks. Trucks are used for stockpiling the excess trap rock which is reclaimed with an electric 1¼-yd. Marion clamshell crane that reloads to trucks. The trucks can load gondolas after a short haul to an overhead platform alongside the tracks from which the cars are loaded.

The Clingan Quarry

The face of the quarry is notable on account of its height, which reaches to a maximum of 230 ft. with about 110 ft. being average through most of the quarry. The operation is all conducted from a single bench.

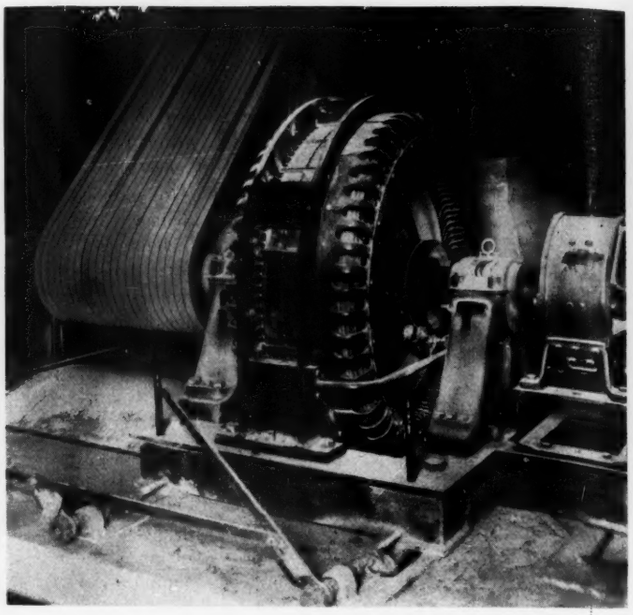
Two model 5-O-B, 6-in. Armstrong well drills, gasoline-engine driven, are used for putting down the blast holes, which are made 10 ft. below the quarry floor, and with center-to-center distances of 20 ft. along the face and 35-ft. burden. Loading of the holes and shooting are all done under the direct supervision of the blasting experts of E. I. duPont de Nemours and Co. with various percentages of 75, 60 and 40% dynamites being used. Cordeau-Bickford is used as the detonator.

The last shot of 14 holes, having a total linear footage of 4012 ft., yielded roughly 180,000 tons of stone, and the next shot of 20 holes is expected to give a larger tonnage of stone and at a slightly lower powder cost. On account of the high face and the nature of the material, high tonnages of stone are secured per pound of powder. This will range from 6 to 7 tons per pound of powder. Jackhammers are used for secondary drilling.

From 2 to 10 ft. of stripping is done which is mostly removed by a 1-yd. Marion, Model 28, with carts drawn by single horses, being used for hauling the strippings to the dump. Carts have been found most successful for this work on acount of the unevenness of the surface. As most of the stripping is done in the winter months, the carts are used in the quarry during the busy season to haul stone to the primary crusher although most of the trap rock is hauled in a fleet of 4-ton Autocar trucks,

Primary crusher building at Clingan plant

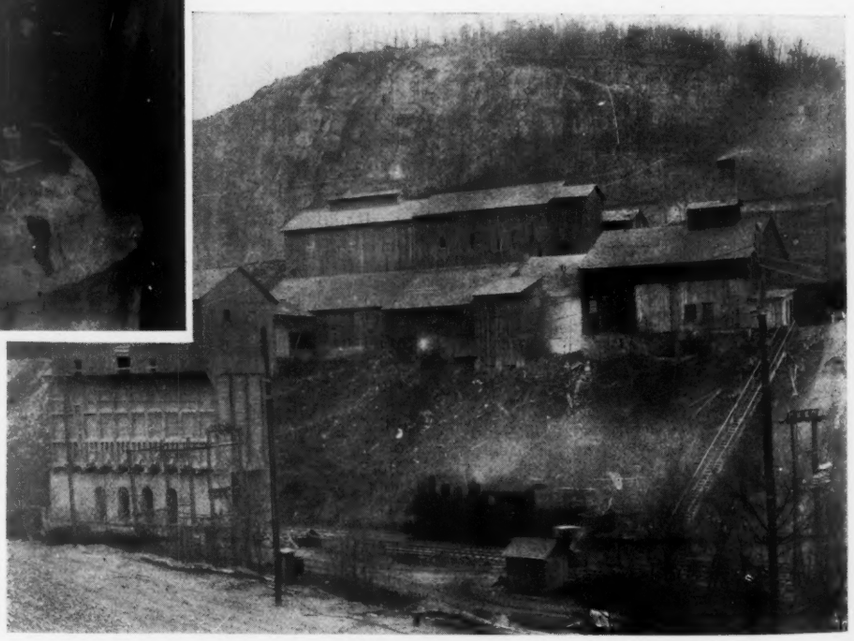
Two pieces of old belt, at right, keep cart horses from running into watering trough



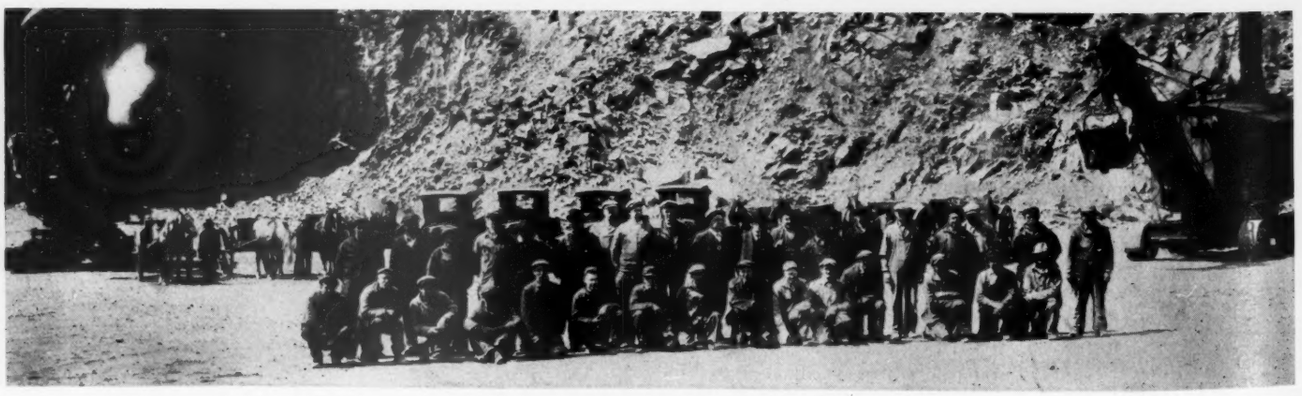
This 300-hp. synchronous motor operates most of the plant

Below—General view of plant

One of the old crushers that has had an unusual life



VIEWS OF THE CLINGAN QUARRY AND PLANT



Plant and quarry crew at Clingan plant of John T. Dyer Quarry Co.

After the coyote hole shot

the company having seven of these trucks in service at this plant, five at present being in the quarry and two at the stockpile. Twelve horse carts are in use at present, each cart holding one ton. The quarry trucks have a level haul of about 400 ft.

Loading is done by two Marion steam shovels, a Model 37 having a 1¼-yd. dipper, mounted on crawler treads, and a Model 31 of the same make mounted on tractor wheels.

Air for secondary drilling is supplied by a type ER-Q Ingersoll-Rand, 14-in. by 12-in. compressor driven by a 100-hp. Westinghouse motor. Small drill steel is sharpened on an IR 50 sharpener. The well-drill bits are sharpened on an Armstrong drill sharpener.

The Clingan plant has a normal capacity of 1500 tons per day and employs 70 men. Levi Carson is superintendent, Nickolas Phillips, foreman and H. Hiester Eschelman in charge of the office at the plant.

H. W. Craig is superintendent of the Monocacy plant, succeeding Wm. A. Kelly, whose death was recorded in the January 17 issue of Rock Products.

The officials of the John T. Dyer Quarry Co. are thorough believers in the principles of safety-first and have an engineer, H. A. Rowan, who has charge of that phase of the company's business. They have tried out this idea of a safety engineer for some time and found that the additional expense involved was more than offset by the advantages of having safe workmen in a safe plant. The company also distributes a monthly pamphlet, "The Safe Worker," devoted to safety education.

The main offices of the John T. Dyer Quarry Co. are at Norristown, Penn. F. T. Gucker is president and general manager.

To Investigate Cement Industry

AN INVESTIGATION of the cement industry by the Federal Trade Commission to ascertain whether the industry is upholding cement prices in violation of the anti-trust laws is ordered under the provisions of the resolution (S. Res. 448) adopted February 16 by the Senate.

The resolution, introduced February 12 by Senator Norris (Rep.), of Nebraska, states that the Federal Trade Commission has received many complaints to the effect that the uniformity of cement price quotations in various sections of the country is highly indicative of an arrangement among the manufacturers and dealers to arbitrarily fix and maintain prices.

Another reason given for the proposed investigation is the present wide public interest in cement prices because of extensive public construction and road building.

Senator Kean (Rep.), of New Jersey, objected to the immediate consideration of the resolution when it was introduced. After consideration had been postponed upon Senator Kean's objection, Senator King (Dem.), of Utah, said the matter should be investigated by the attorney general. Senator Norris, however, declared that the Trade Commission should make an investigation before the Department of Justice is requested to act.

Text of Resolution

The Norris resolution (S. Res. 448) follows in full text:

"Whereas there is a wide public interest in the price of cement, due primarily to the increase in building construction and road building; and

"Whereas many complaints have been rereceived by the Federal Trade Commission from various sections of the country to the effect that the price quotations of all cement companies are uniform and that such uniformity in price is highly indicative of an arrangement, understanding or agreement between and among the various manufacturers and dealers in cement to arbitrarily fix and maintain prices: Therefore, be it

"Resolved, that the Federal Trade Commission be, and it is hereby, directed to investigate competitive conditions in the cement industry and report to the Senate of the United States:

"1. The facts with respect to the sale of cement and especially the price activities of trade associations composed of either manufacturers of cement or dealers in cement or both.

"2. The facts with respect to the distribution of cement, including a survey of the practices of manufacturers or dealers used in connection with the distribution of cement.

"3. Whether the activities in the cement industry on the part of trade associations, manufacturers of cement or dealers in cement constitute a violation of the anti-trust laws of the United States and whether such activities constitute unfair trade practices."

Mechanical department, Clingan plant. Chief Clerk H. H. Eschelman at right

Mining and Crushing Methods and Cost at Monocacy Quarry of John T. Dyer Co.*

By Joseph A. Conway
Consulting Engineer, U. S. Bureau of Mines

IN 1890 John T. Dyer, operating a limestone quarry at Howellville, Penn., was forced through demands of the railroads to seek harder rock for ballast. He delegated several of his men to scour the country for stone to meet these requirements. One of these men, William Johnson, superintendent of the Howellville quarry and former resident of Berks county, recalled that at the time the Wilmington and Northern railroad was being built, several contractors had encountered considerable difficulty in excavating a deep cut through a hard rock about one mile south of Birdsboro. Johnson investigated this rock and found it to possess the qualities for which he sought. Dyer approved of the location and the railroads were satisfied with the hardness of the rock. Therefore, after securing a lease to the property in 1894, a plant was erected and started.

In 1911, because of the necessity of increasing production and the desire to secure a site on another railroad, the John T. Dyer Quarry Co. purchased a property on the same trap rock dike about three miles to the west.

In 1906 competitors started operations about three miles east of the Birdsboro quarry. This property was taken over by the John T. Dyer Quarry Co. from the Birdsboro Stone Co. in 1925 and is now known as the Monocacy quarry.

Geology

The rock quarried by the John T. Dyer Quarry Co. is known as trap rock. Trap rock is a general term used to designate all kinds of dark basic igneous rocks, especially those having the finer texture. Frequently certain granites are incorrectly classified as trap rock because of their dark color. The principal distinction between trap rock and granite lies in the difference of their chemical compositions; trap rock is a basic igneous rock and granite is an acid igneous rock. Any acid igneous rock, therefore, regardless of color, would be more correctly classified as granite. The binding qualities of these acid rocks are poor.

At the quarries located at Trap Rock, Clingan, Monocacy and Monocacy Hill the rocks were once in a fluid or molten condition and while in this state were forced up through fissures in other rocks to the position they now occupy. They occur as dikes where they have solidified in vertical fissures, and as immense sills or lenses where they have been forced into and between the strata of horizontal sedimentary rocks.

Characteristics of Rock

The rocks are somewhat gray in color, of medium coarseness and are crystalline basic rocks belonging to the species of trap rock known as gabbro. Throughout the immediate vicinity of the quarries the strata of sedimentary rocks have been dislocated, faulted and upturned by the intruded igneous rocks and by the various movements which have later taken place. Being more resistant than the sedimentary rocks, the trap gives rise, through erosion, to prominent topographic features.

In many places there is no overburden, especially on the tops of the several hills where large boulders of trap rock are at the surface; but passing to the lower slopes the overburden increases and red shale is usually found. This lack of overburden is due to the fact that trap rocks resist erosion better than the surrounding rocks.

The color varies in proportion to the amount of feldspar, ferromanganese, hornblende and other minerals present. The proportion of these minerals also determines the hardness of the rock. Compression tests were made by Prof. H. C. Berry of the University of Pennsylvania showing the following results:

	Average ultimate crushing strength, lb. per sq. in.	Number of specimens tested
Clingan	22,956	9
Birdsboro	19,622	9
Monocacy	21,873	9

Throughout the deposit the presence of joints is pronounced. These joints are cracks or fissures which divide the mass into blocks, fitted together like masonry. The main system of joints roughly trend in the direction of south 40 deg. west and are very nearly vertical. At the Monocacy, Clingan and Monocacy Hill quarries these joints furnish excellent lines of parting and stand out as smooth vertical walls, often extending for a distance of 50 ft. or more.

At the Birdsboro quarry this jointing is largely obliterated by the effect of slickenslides. These slickenslides were the result of compression which caused the rocks to move or slide upon each other and often crumbled the rock into smaller units. This accounts for the ease of fragmentation at this quarry. Throughout the quarry there are no well developed fissures or caves except in one place where a depression was caused by the erosion of a zone of weakness in the rock which was then filled with clay. This zone of weakness developed through the folding and crushing of the rock.

There is another type of joints or faults which are roughly at right angles to the main joints described which incline about 45 deg. northwest. This type of joint is not so well defined as the main system, but is fairly well marked in all of the deposits.

This general trend of joints tends to make the rock break up in roughly rectangular blocks varying in size from dimensions of fractions of an inch to 5 by 7 ft. An exception to this occurs in the center of the Clingan quarry where jointing is poorly developed so as to cause fragmentation to be very poor, thus increasing the secondary drilling and blasting costs.

Estimation of Tonnages

The tonnage of unquarried rock available and the life of each plant have been estimated as follows:

	Tons	Life in years
Birdsboro	101,500,000	440
Clingan	11,000,000	60
Monocacy	160,000,000	330
	272,500,000	

Stripping

The overburden averages about 5 ft. in depth. An Osgood 29 caterpillar shovel with a 1-yd. bucket loads the dirt into rocker-dump cars, having a capacity of 2 tons, which are drawn by a 4-ton Plymouth gasoline friction-drive locomotive upon 36-in. gage portable tracks. About 250 yd. of dirt, which has no value, is removed daily and hauled to the dump about 1000 ft. away. Since the job of stripping or removing overburden is intermittent, the caterpillar shovel performs many other tasks in and about the quarry and is therefore classed as service equipment; that is, equipment that does work for other departments. Details of the cars used in stripping are shown in Fig. 2.

Well Drilling

Churn drilling is done by a Loomis clipper and a Keystone drill belt-driven by an 11-hp. Westinghouse slip-ring motor and a 15-hp. Allis-Chalmers slip-ring, ball-bearing motor, respectively, using 8-in. "Carr" bits made of high-grade drill steel. The drilling speed is about 8 in. per hour, the holes being spaced 35 ft. apart and 40 ft. from the bench face. This spacing is necessary due to the colum-

*Abstract from U. S. Bureau of Mines Information Circular 6405.

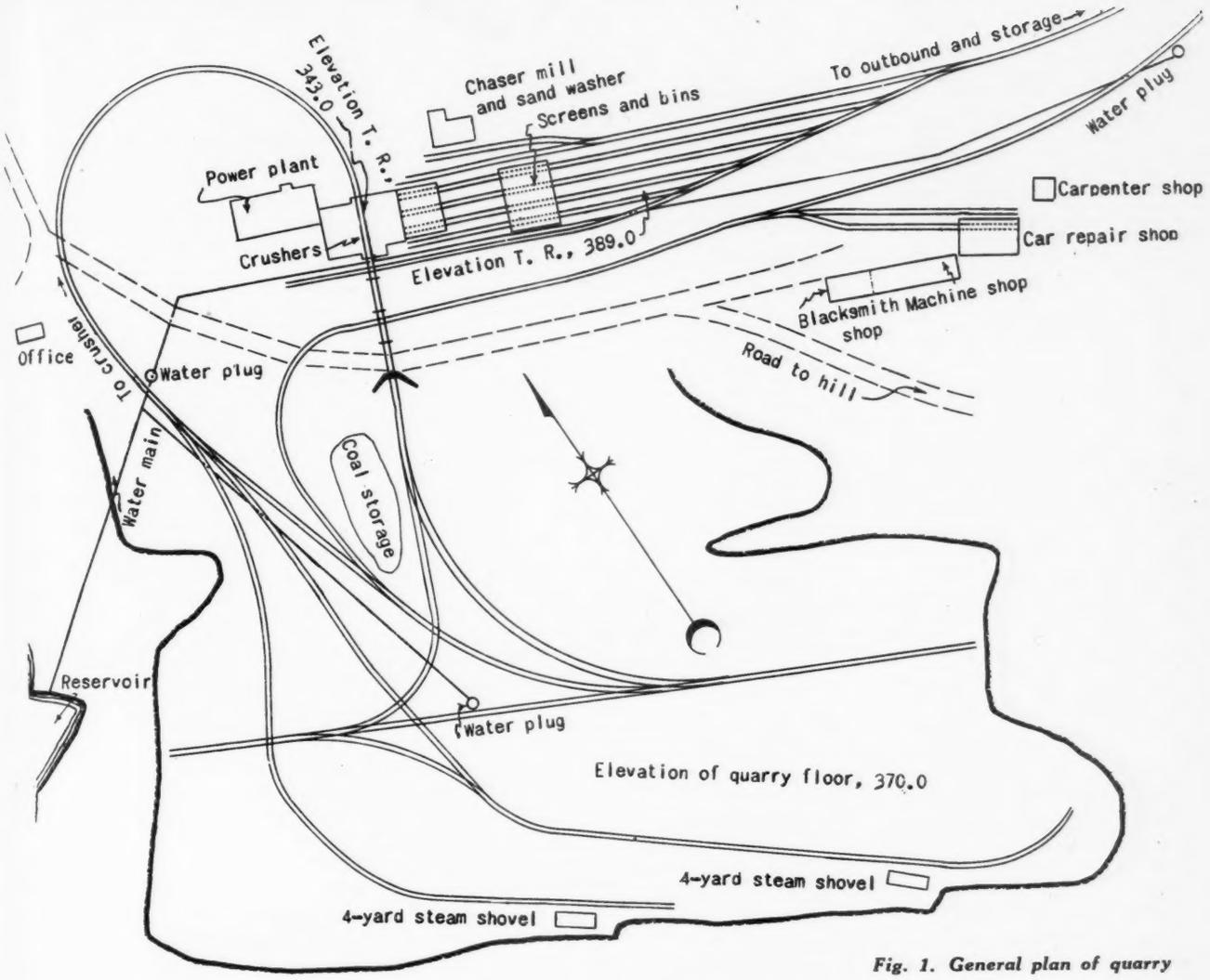


Fig. 1. General plan of quarry

nar formation, the hardness of the rock, the height of the face (maximum being 310 ft. and minimum 225 ft.), the large number of holes shot simultaneously and the fragmentation desired. The drills usually work from side to center, drilling holes 8 in. in diameter to a depth of 10 ft. below the level of the quarry floor.

Due to the height of the face and the type of joints, the drills have a tendency to follow these joints or cracks so that many holes are lost before reaching the desired depth; therefore well drilling is a very expensive operation.

Tunnel Drilling

To reduce this expense, tunnel or gopher drilling has been tried, and up to the time of this writing it has been found very successful. This type of drilling is done with I.R.-L-74 drifter drills which weigh 94 lb. mounted. Compressed air is delivered at a minimum pressure of 75 lb. per sq. in. at the drill. The average air consumption is 75 cu. ft. per min. per machine, including line loss, at peak load. One-inch hexagon hollow drill steel is used to drill the holes which are 1½ in. in diameter and 4½ ft. long. A two-man crew working a 10-hour shift would advance from 20 to 25 ft. per week, mucking, drilling and shooting in one shift. The method used was to make a five-hole burnout cut with seven trim holes (Fig. 5). The holes are so arranged that the size of the tunnel will be 4 ft. wide and 5 ft. high, enabling loading and mucking to be done with ease.

Blasting Well-Drill Holes

Sixty per cent. 7- by 24-in. quarry gelatin, with double countered cordeau, is used in blasting the well-drill holes. Springing is not practiced as the holes are drilled large enough to accommodate the powder to lift the toe. Cordeau is lowered with the first cartridge of powder, the balance of the powder is dropped in the hole and distance is measured after 10 cases have been loaded. Two crews, usually consisting of powderman and helper, load the holes; 20 cases of 7- by 24-in. cartridges are loaded in 8 min. After the holes are loaded, dirt is poured in and left to settle.

If a hole becomes plugged while loading, tamping blocks similar to those shown in Fig. 3 are used. These blocks were developed by the men at the plant after encountering difficulties in the use of others. Their superiority is that the pointed bottom section will punch through the clogged dynamite rather than drive it down by compression, while the shape and length of the upper section tend to force the blow near the center of the dynamite rather than against the walls. Also blocks of this shape are not so likely to damage cordeau or dislodge loose rock from the sides of the hole.

The routine of the work of loading a hole after the dynamite has arrived by railroad and the company's own locomotives have placed cars on the quarry floor is:

1. Unloading freight cars and loading truck.
2. Truck to skip car.
3. Skip car to hole.
4. Bail water out of holes.
5. Lower cordeau with first cartridge.
6. Drop balance of powder measuring every 10 cases.
7. Pour dirt in hole, leaving it to settle.

The fragmentation obtained is usually from a fraction of an inch to 60- by 84-in., a minimum of secondary blasting being necessary because of the large primary crusher.

On May 30, 1927, 27 well-drill holes and one tunnel were shot simultaneously by

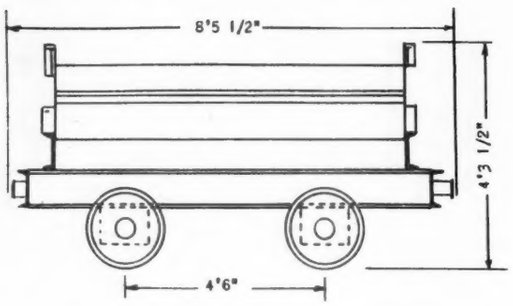


Fig. 2. Car used for stripping

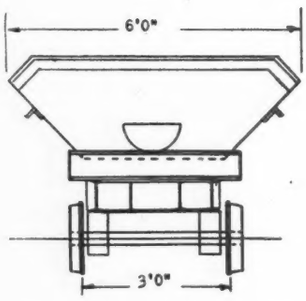
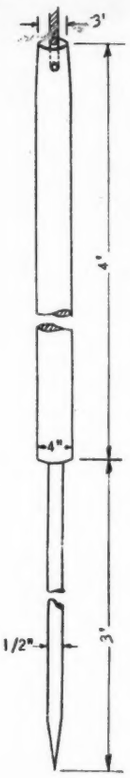


Fig. 3. Wooden tamping block for tamping charge in well drill hole



means of 169,000 lb. of dynamite, bringing down 1,000,000 tons of rock at a cost of $0.0784 per ton. In the center of the quarry, where the face is 270 ft. high, trouble was experienced in reaching bottom so that for four or five years it was not blasted. In an endeavor to get this stone and straighten up the face, a tunnel was driven in this section to a depth of 108 ft. and three laterals were driven on each side. In addition a line of well drill holes was drilled on the left side face with a few 100-ft. holes back of the tunnel to take care of the top breakage, to throw the top stone, and to make sure that the broken bank after the shot would not be dangerously high.

The results obtained with this shot were so satisfactory that it was decided to continue with the tunnel method of blasting. Well drilling has been discontinued, and where the face exceeds 200 ft. two level tunnels are driven so as to give a burden over each tunnel of 100 ft. or more.

Blasting Tunnel

On April 30, 1929, two top level tunnels were fired. The tunnel portals were started 120 ft. above the quarry floor and were driven level. At the west end, where a considerable end break was to be expected, a 93-ft. well was drilled to give better breakage in this section and was loaded with 2500 lb. of 60% quarry gelatin. This, added to the load in the tunnels, made a total load of 44,500 lb. The main tunnel load was 40% Red Cross Extra dynamite. The plan and loading of coyote tunnels and drill-hole shot on April 30, 1930, are shown in Fig. 4. [This blast was described in Rock Products, May 10, 1930.—Editor.]

The problem of supplying the powder and stemming to the tunnels was solved by the use of the Osgood 29 shovel which was fitted with a crane boom and mounted on the top ledge of the quarry. The dynamite in the original boxes was lowered to the tunnel portals, where the boxes were opened and the 5- by 16-in. cartridge stacked in wheelbarrows and wheeled over a board flooring into the tunnel. In this manner approximately 200 to 350 lb. of dynamite was taken in at a time and piled like cordwood in the unit for which it was intended.

No. 12 waterproof duplex leading wire was strung in each tunnel, and a separate circuit was made for each wing. This was supported at 12-ft. intervals by screw eyes in the roof. The screw eyes were placed in bolt expanders driven into drilled holes in the roof. Two No. 6 electric detonators were placed in each unit and connected in parallel with the wing tunnel circuit. As an additional precaution a line of cordeau was run to the portal of the main entry and another line of cordeau was used to connect the last unit of each wing with the last unit of the opposite wing.

Single No. 10 leading wire was used to connect both tunnels and the well-drill hole all in parallel, and the shot was fired from a 440-v., a.-c. line.

No stemming was used between the wing units, but at the junction of the main tunnel and the last wing unit, powder boxes filled with dirt were piled to the roof to act as a bulkhead and the balance of the tunnel was filled to the portal with dirt. The use of dirt as stemming in this shot is in sharp

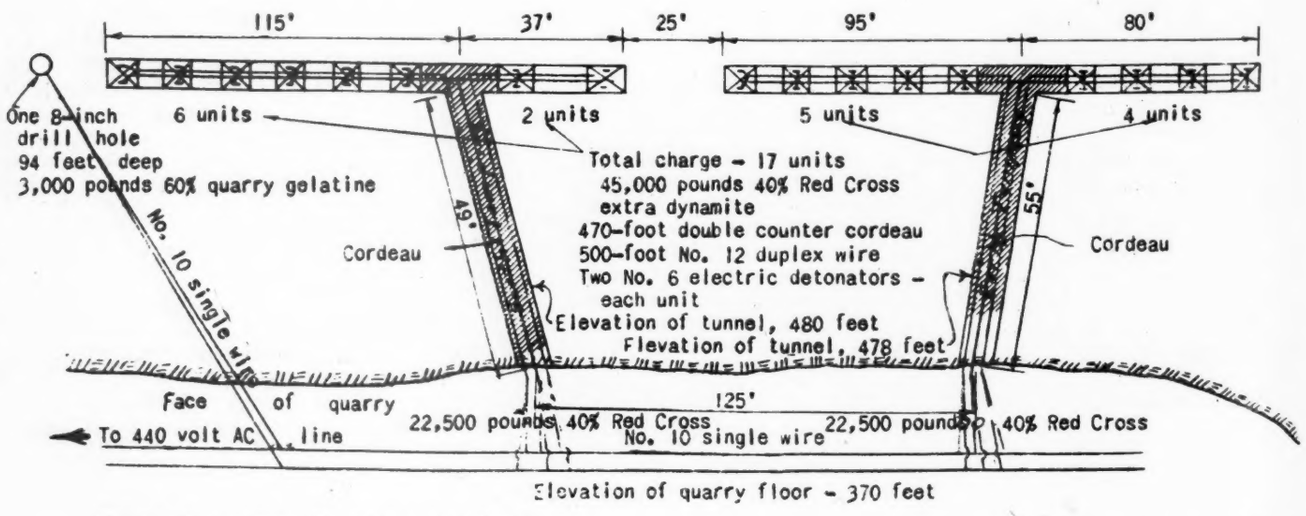


Fig. 4. Plan and loading of coyote tunnels and drill-hole shot on April 30, 1930

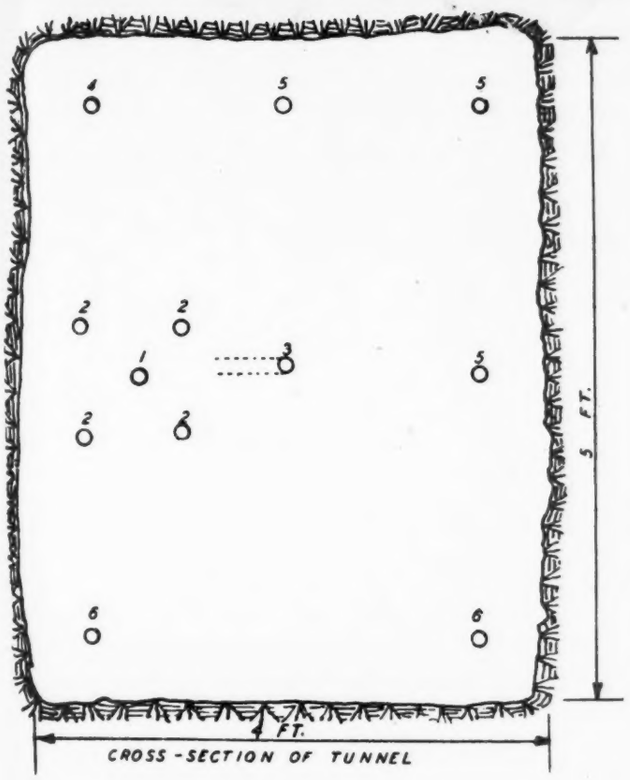


Fig. 5. Layout of drill holes in coyote tunnels by burn-out method; all holes 4.5 ft. deep. Hole No. 1 was unloaded, and others fired in numerical order

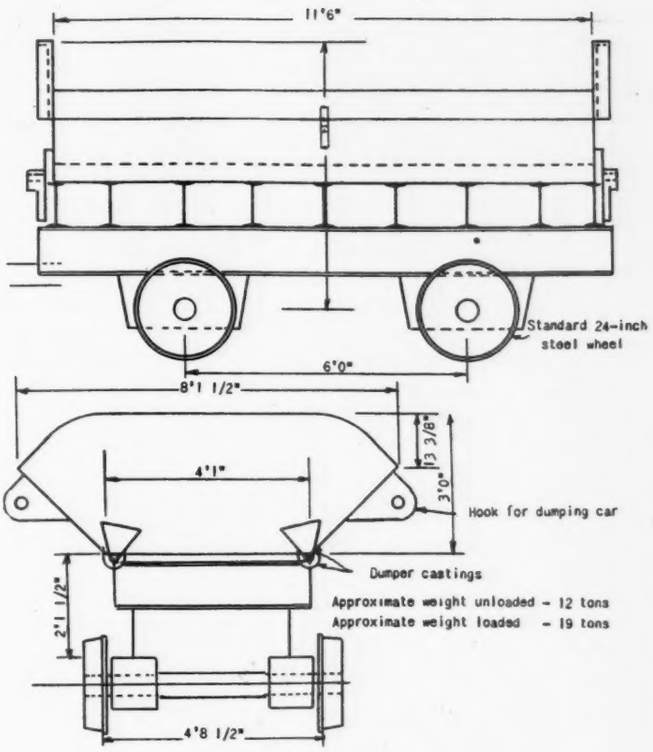


Fig. 6. Quarry cars

contrast with the use of water in the tunnel shot on May 30, 1927.

This tunnel blast was very successful, as it brought down 250,000 tons of rock at a cost per ton of $0.0336 as compared with $0.0784 per ton, the cost of the shot on May 30, 1927.

DETAILED COST OF TUNNEL SHOT, APRIL 30, 1930

	Amount	Cost Per ton	Cost Per foot
Tunnel drilling			
Labor operating	$ 826.30	$0.0033	$1.9172
Power	591.32	.0024	1.3720
Labor repairs	684.70	.0027	1.5886
Material repairs	242.67	.0010	.5630
Explosives	209.77	.0008	.4867
Shops	9.84	.....	.0228
Tools and miscellaneous supplies	135.44	.0006	.3143
Total	$2,700.04	$0.0108	$6.2646
Well drill			
Labor operating	$ 177.00	$0.0008	$1.9032
Power	31.67	.0001	.3405
Labor repairs	34.65	.0001	.3726
Tools and miscellaneous supplies	.22	.....	.0024
Lubricants	4.19	.....	.0451
Shops	25.01	.0001	.2689
Total	$ 272.74	$0.0011	$2.9327
Stripping			
Labor shovel	$ 254.04	$0.0010	.....
Coal	93.00	.0004	.....
Labor repairs	119.26	.0005	.....
Tools and miscellaneous supplies	4.56	.....	.....
Shops	6.29	.....	.....
Total	$ 477.15	$0.0019	.....
Explosives	4,956.91	.0198	.....
Total cost	$8,406.84	$0.0336	.....
Tons shot		250,000	
Well-drill feet		93	
Tunnel feet		431	

Secondary Blasting

Twenty-five to 30% of the rock on the quarry floor exceeds a size of 60 by 84 in. and therefore requires secondary blasting. Mud capping or block-holing are the methods used in secondary blasting. The size and shape of the boulder govern the position of the holes. The quantity of explosives used in secondary and primary blasting averages about the same, each costing $0.02 per ton. Charter oak fuse, with a burning speed of 1 ft. per min., is employed.

Loading Stone on Quarry Floor

Two steam, railway type, Marion Osgood 120 and Bucyrus 950 shovels mounted on traction wheels and equipped with 4-yd. dippers are used in loading rock. The idea of traction wheels on a railway shovel for use in quarry work was developed at this quarry, the advantages being that the greater flexibility of the shovel gives approximately 50% more capacity by speeding up the work and that four laborers are eliminated on each shovel. These shovels are each operated by three men—an engineer, a cranesman and a fireman, and a utility man acts as pitman on the shovels and as a powderman's helper when secondary blasting is being done. These shovels will load eight cars of 9 tons capacity in five minutes, averaging about 2000 tons of rock per day each.

Transportation to Crusher

The transportation from the quarry floor is taken care of by four H. K. Porter 18-ton, saddle-tank, steam locomotives with 4-wheel drive of standard gage. These locomotives each draw 3, 4 or 5 all-steel cars with flat bottom and sloping sides of 10 tons capacity up a grade of 1½% to the crusher and down a grade of 4% from the crusher. The cars were designed and built at the plant. This distance from the quarry face to the crusher is about 1000 ft. Eighty-five pound rails are used where the tracks are permanent and 70 lb. rails where they are temporary. The locomotives make a complete circle through spring switches that do away with the need of a brakeman and switchman. Each engineer operates the locomotives, fires, takes water and lubricates his cars. The fuel used for the locomotives is a high volatile coal which is delivered on the quarry floor by the shipping locomotive and unloaded by a crane. Details of the quarry cars are shown in Fig. 6.

Drainage

The quarry has a natural drainage. The surface water flows out from the quarry face to a stream 30 ft. below the floor.

Crushing Plant

A plan and elevation of the crushing plant are shown in Figs. 7 and 8.

An electric hoist, built at the plant, driven by a 25-hp. G. E. squirrel-cage motor dumps the stone from the quarry cars into the primary crusher. The arrangement for unloading cars is shown in Fig. 9.

The flow sheet of the plant is shown in Fig. 10.

The stone after leaving the quarry cars flows through the following equipment:

1. 60- by 84-in. Blake crusher.
2. 30-in. Superior McCully gyratory crusher.

3. 54-in. conveyor belt.
4. 60-in. elevator bucket.
5. Grizzlies.
6. Two 84-in. scalping screens.
7. Four 16-in. special crushers.
8. 36-in. conveyor belt.
9. Discharge split feed:
   Vibrating screen.
   60-in. by 16-ft. screen.
10. Washing.
11. 60-in. by 24-ft. sizing screens.
12. 48-in. by 16-ft. revolving screens.
13. Symons 4-ft. cone crusher.
14. Elevator vertical.
15. Chaser mill.

Primary Crusher

The primary breaker is a 60- by 84-in. Blake jaw crusher, manufactured by the Power and Mining Machinery Co., with an opening of 11 in. at the discharge. This machine has been rebuilt at the plant to meet the special requirements necessary in the crushing of hard rock. It is driven from an extension shaft, one end of which is connected through a flexible coupling to 500-hp., G. E. slip-ring, variable-speed motor and the other end through a similar coupling to a 500-hp. G. E. low starting torque synchronous motor.

The induction motor is for starting and emergency. In starting when the extension shaft has reached synchronous speed the motor is thrown in and the induction motor is cut out. Thus under running conditions the induction motor is idling on the line. The use of the 500-hp. synchronous motor is necessary to improve the power factor and provide sufficient power to meet peak loads. The 30-in. Superior McCully gyratory crusher also receives its power from this source by belt drive.

Secondary Gyratory Crusher

The 30-in. Superior McCully gyratory crusher is manganese-fitted throughout and has a spider which was specially designed at the plant. The feed to this crusher is by gravity and is directly underneath the primary jaw crusher. The discharge end has an opening averaging about 4½ in. from which the stone is discharged on to a 54-in. conveyor belt.

Stone averaging in size from a fraction of an inch to approximately 5 in. is carried to the 60-in. elevator by a 54-in. rubber conveyor belt 88 ft. long driven direct by a 25-hp., G. E., squirrel-gage motor on a speed reducer, having an hourly capacity of about 600 tons.

Power is transmitted to the 60-in. elevator by a 150-hp. G. E. induction motor through a chain drive and spur gear reduction. The elevator inclines about 70 deg., is 74 ft. center to center, equipped with 83 buckets and carries the stone from the 54-in. conveyor belt to the two grizzlies. This elevator, which was also designed at the plant, has double the capacity of the previous elevators and has cut the speed down about 40%.

Preliminary Screening

The scalping screens are relieved of some of the fines by two grizzlies placed at the head of the 60-in. elevator and made of perforated plates having round holes of 2¾ in.

The two 84-in. scalping screens are 20 ft. long and are driven by a 75-hp. G. E. motor through a silent-chain drive. These screens have been built from patterns and drawings made at the plant and consist of four sections; the first three sections have 3-in. round openings and the last section has a 3½-in. square opening.

Special Crushers

Four special Superior McCully crushers, each driven by 150-hp. Ideal motors direct-connected with flexible couplings, receive the stone which is rejected on the two 80-in. scalping screens, reducing the size to 1¾-in., which is the discharge setting of the crusher. The discharge from the 16-in. crushers is returned to the 60-in. elevator and thence to the 84-in. scalping screens, thus forming a closed circuit.

The minus from the scalping screens is delivered on to a 36-in. rubber conveyor belt and carried for a distance of 100 ft. to the screening and bin building. This conveyor, 110 ft. long, inclines 22 deg. and is driven from a line shaft in the screen building by the motor, which also drives the two revolving screens.

Secondary Screens

Stone is delivered by means of a split feed to a 60-in. by 16-ft. Allis-Chalmers revolving screen and a 6- by 10-ft. heavy duty, double-deck Niagara vibrating screen.

The 60-in. by 16-ft. screen is equipped with round perforations of 1¼ in. for the

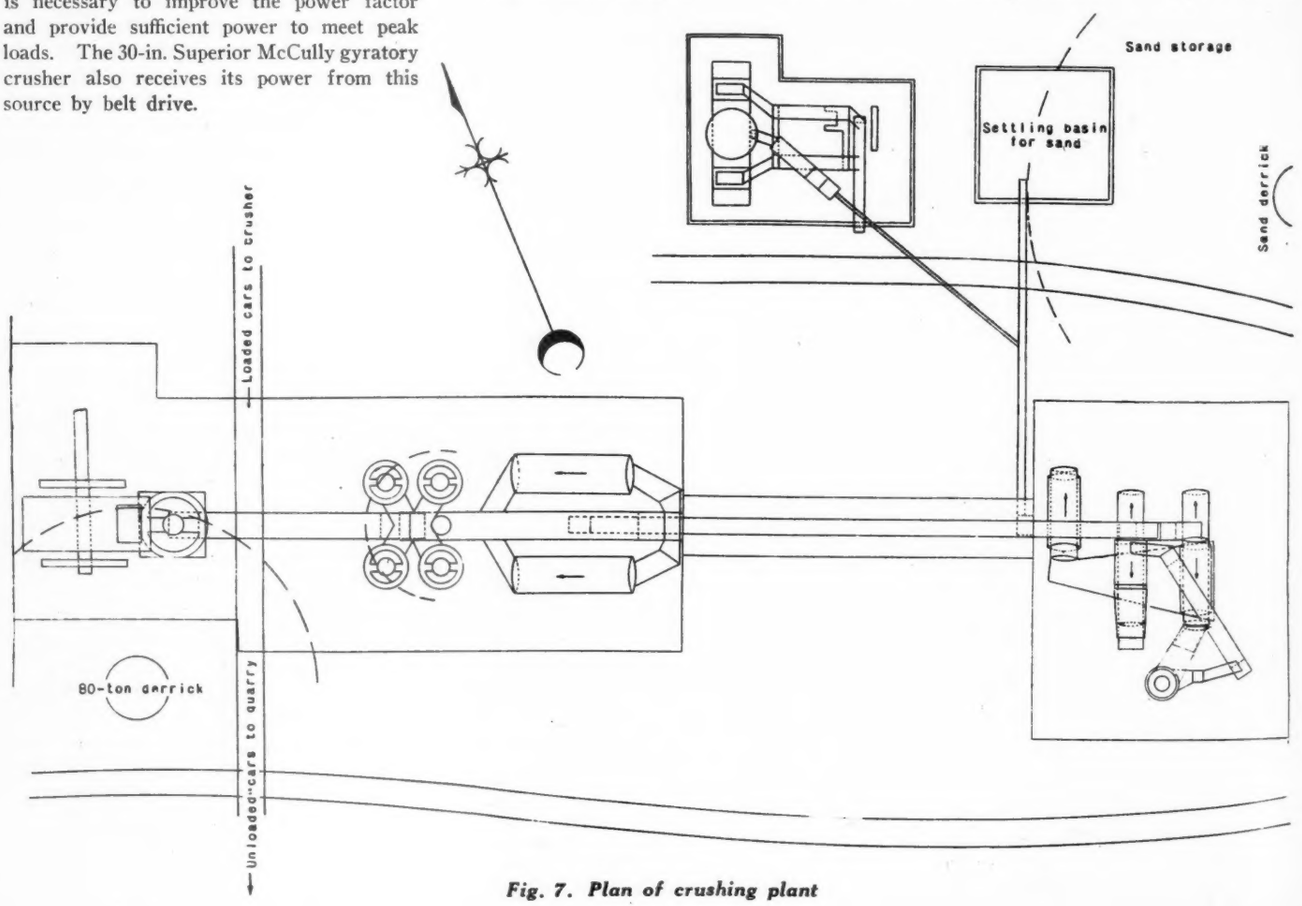


Fig. 7. Plan of crushing plant

full length and jacketed with perforations of ⅞-in. This screen and the two 60-in. by 24-ft. screens are driven from line shafts by means of two 75-hp. G. E. motors. The rejects from this screen are delivered to the 60-in. by 24-ft. revolving screen. The rejects from the outer jacket are delivered to the commercial ¾-in. bins. The minus from the outer jacket is delivered to the 48-in. by 16-ft. screen.

The vibrating screen is equipped with wire cloth openings on the top deck of 1⅛-in. and 11/16-in. on the bottom deck and is driven by a 7½-hp. G. E. motor. The rejects from the upper deck are delivered to the 60-in. by 24-ft. revolving screen. The rejects from the lower deck are delivered to the commercial ¾-in. bin. The minus from the lower deck is delivered to the 48-in. by 16-ft. screen.

Washing

After the stone leaves the 36-in. conveyor belt and is received by the above screens the stone is washed by the spray method. The water is received by means of gravity through pipes which are 10 in. in diameter at the reservoir on top of the quarry and 5 in. in diameter at the crusher.

Sizing Screens

Rejects from the 60-in. by 16-ft. revolving screen and the 6- by 10-ft. vibrating screen are delivered by means of gravity on steel chutes to two 60-in. by 24-ft. Allis-Chalmers rebuilt screens. These two screens are each equipped with six sections, two of which have round perforations of 1¼-in. and the other three having round perforations of 1¾-in. They are driven from line shafts by the two 75-hp. G. E. motors, which also furnish the power for the 60-in. by 16-ft. screen. The rejects from these screens are emptied into the ballast bins.

The minus stone from the vibrating screen and the 60-in. by 16-ft. revolving screen is delivered by means of gravity to a 48-in. by 16-ft. revolving jacketed screen which has ½-in. round perforations on the inside and ¼-in. round perforations on the outside. The two 75-hp. G. E. motors also supply the power for this screen. The minus ¼-in. stone and water which passes through is led outside the bin building by means of a sluice and discharged into a 20- by 20-ft. concrete pit. The overflow from this pit, consisting of water and stone dust, passes to a stream and the sediment in the pit is picked out by a clamshell bucket and placed on the sand storage pile, on cars for shipment or sent to Chaser mill for further reduction.

Special Reduction Crusher

The 4-ft. Symons cone crusher is an auxiliary crusher and is set at the discharge end of the 60-in. by 16-ft. revolving screen. When the demand is large for small sizes, the rejects from the 60-in. by 16-ft. screen instead of going to the 60-in. by 24-ft. screens are diverted by means of a steel chute to the 4-ft. cone crusher. After passing through this crusher the stone is lifted by means of a vertical elevator to the 6- by 10-ft. vibrating screen, from which it passes over the same screens as previously explained. A 200-hp. Westinghouse synchronous motor furnishes the power for this crusher, but the plant is charged with a rating of only 100-hp. by the electric company from which the power is purchased.

A continuous bucket elevator, manufactured by the Chain Belt Co., with a capacity of 150 tons per hour and driven by a 25-hp. G. E. motor, carries the stone from the 4-ft. cone to a short conveyor which discharges on to the 6- by 10-ft. vibrating screen. This bucket elevator has a capacity of 150 tons.

Chaser Mill

At present a 9-ft. chaser mill, wet type, manufactured by the Lewistown Foundry and Machine Co., is being installed. This mill will be belt-driven by a 30-hp., G. E. squirrel-cage motor and is expected to produce 125 tons daily through 30-mesh.

APPROXIMATE TONNAGE PASSING OVER EACH SCREEN, BY SIZES

	Tons per hr.	Average life
Scalping screen (each)		
Minus 3-in.	140	1 to 3 years
Plus 3-in.	100	
	240	
Grizzly		
Minus 2¾-in.	60	
Plus 2¾-in.	240	
	300	
Vibrating screen		2 to 3 months
Over upper deck:		
Minus 3-in. plus 1⅛-in.	145	
Over lower deck:		
Minus 1⅛-in. plus ⅞-in.	17	
Through lower deck:		
Minus ⅞-in.	37	
60-in. by 16-ft. screen		1 to 3 years
Over inner jacket:		
Minus 3-in. plus 1¼-in.	145	
Over outer jacket:		
Minus 1¼-in. plus ⅞-in.	17	
Through outer jacket:		
Minus ⅞-in.	37	
60-in. by 24-ft. screen (each)		1 to 3 years
Rejects:		
Minus 3-in. plus 1¾-in.	115	
Through second section:		
Minus 1¾-in. plus 1¼-in.	22	
Through first section:		
Minus 1¼-in. plus ⅞-in.	9	
48-in. by 16-ft. screen		1 to 3 years
Over inner jacket:		
Minus ⅞-in. plus ½-in.	43	
Over outer jacket:		
Minus ½-in. plus ¼-in.	12	
Through outer jacket:		
Minus ¼-in.	19	

Summary

After reading the foregoing paragraphs one would naturally conclude that this plant is over-motored, as in nearly every case the motors are larger than required to drive the

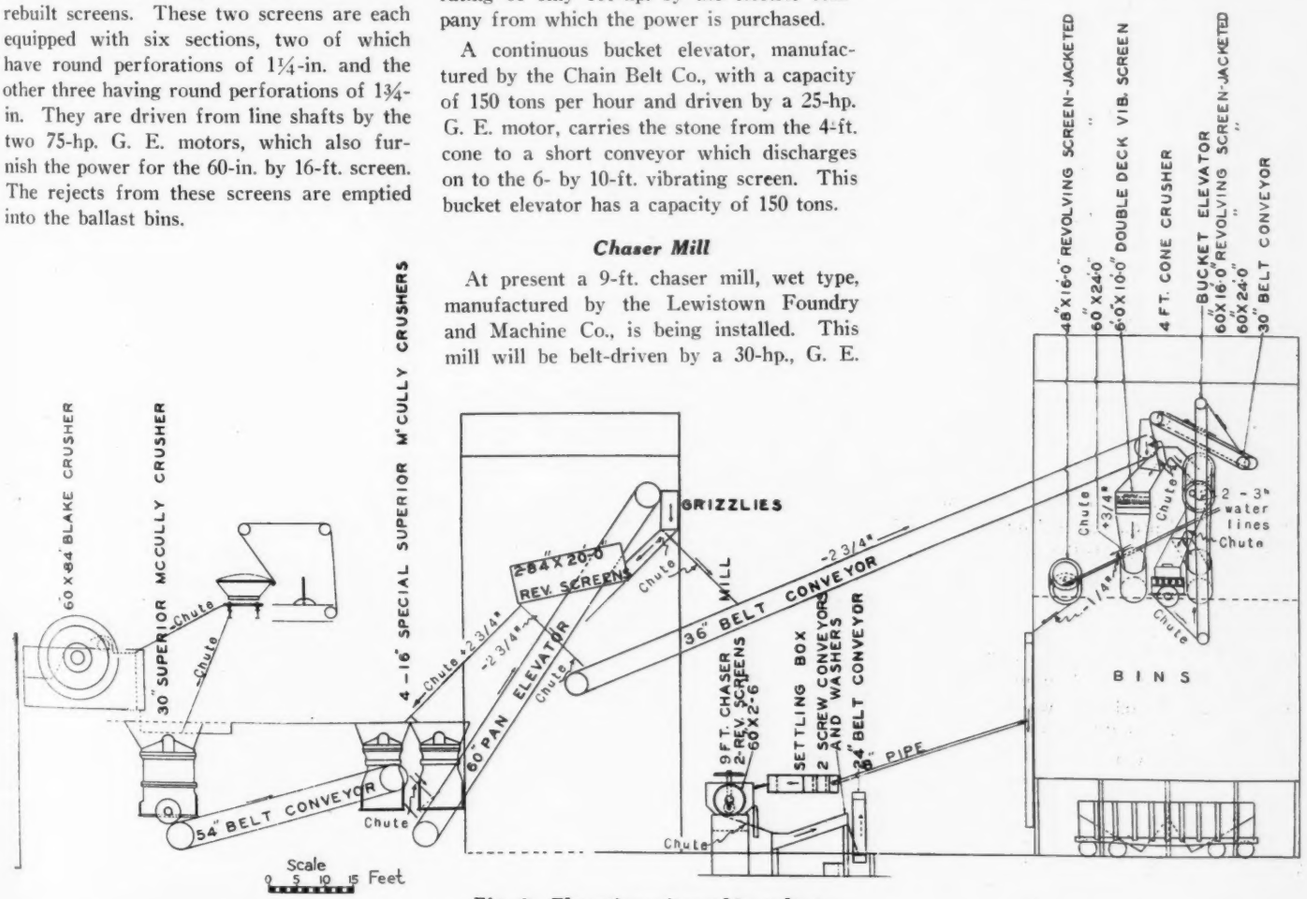

60 X 84 BLAKE CRUSHER
30" SUPERIOR MCCULLY CRUSHER
4 - 16' SPECIAL SUPERIOR M'CULLY CRUSHERS
GRIZZLIES
2-84" X 20'-0" REV. SCREENS
60" PAN ELEVATOR
36" BELT CONVEYOR
54" BELT CONVEYOR
9 FT. CHASER 2-REV. SCREENS 60 X 2'-6"
SETTLING BOX 2 SCREW CONVEYORS AND WASHERS
24" BELT CONVEYOR
24" PIPE
48" X 16'-0" REVOLVING SCREEN-JACKETED
60" X 24'-0"
6'-0" X 10'-0" DOUBLE DECK VIB. SCREEN
4 FT. CONE CRUSHER
60" BUCKET ELEVATOR
60" X 16'-0" REVOLVING SCREEN-JACKETED
60" X 24'-0"
30" BELT CONVEYOR
2 - 3" water lines
BINS
Chute
Scale 0 5 10 15 Feet

Fig. 8. Elevation of crushing plant

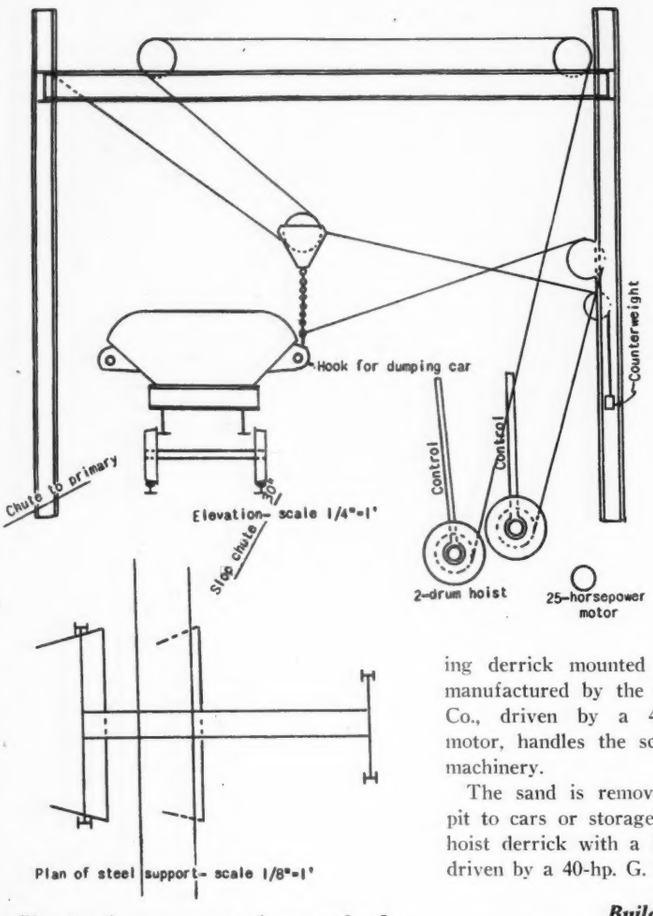


Fig. 9. Arrangement of car unloader

machinery at normal load and are larger than manufacturers of equipment ordinarily recommend. This would be true if the stone were not so extremely hard, thereby causing the peak load to exceed the average load. Maintenance costs have been reduced considerably by the use of larger motors.

It will be noted that this plant supplies the demand for stone, though it makes only five sizes totaling 450,000 to 500,000 tons yearly:

1. Ballast through 3-in. retained on 1¾-in.
2. 1½-in. through 1¾-in. retained on 1¼-in.
3. ¾-in. through 1¼-in. retained on ⅞-in.
4. ½-in. through ⅞-in. retained on ½-in.
5. ¼-in. through ½-in. retained on ¼-in.

(Minus ¼-in. sand is not included in production figures, since previous to this writing all of the sand produced had not been sold.)

The perforations of the screens may be changed from time to time, depending upon the size demanded.

The flexibility of the plant in supplying the demand for stone may be seen from the following maximum and minimum percentages of stone produced, which have been taken from the monthly production covering a period of four years:

Size	Maximum per cent.	Minimum per cent.
Ballast	61	20
1½-in.	37	05
¾-in.	67	10
½-in.	56	07
¼-in.	08	01

Derricks

The placing and removing of equipment in the crusher house is done by a stiff-leg derrick of 75 tons capacity, having a 40-ft. mast and a 55-ft. boom with three blocks and wire cable (made by the Terry Manufacturing Co.) operated by a triple-friction drum, 18- by 30-in., hoisting engine (manufactured by the National Hoisting Engine Co.) connected to a 75-hp. G. E. induction motor.

A 10-ton building derrick mounted with a 50-ft. boom, manufactured by the Terry Manufacturing Co., driven by a 40-hp. Allis-Chalmers motor, handles the scalping and secondary machinery.

The sand is removed from the concrete pit to cars or storage pile by an American hoist derrick with a 1-yd. clamshell bucket driven by a 40-hp. G. E. motor.

Buildings

The crusher building is a steel-frame structure with double-pitched roof and concrete foundations. It covers a ground area of 5087 sq. ft. and has a volume of 229,932 cu. ft.

The bin and screen house is also a steel-frame structure having steel H-columns on concrete as foundation and covers a ground area of 3143 sq. ft. and has a volume of 267,155 cu. ft.

The bins are arranged in such a manner that their contents may be drawn off through gates. One man can load two separate sizes into two railway cars, as each bin has its own individual track.

Transportation to Storage Yard and to the Carrier

The storage yard, with a capacity of 300,000 tons, and the Pennsylvania railroad are about 2 2/10 miles away from the screening and bin house. To handle this transportation problem the plant has two steam locomotives, one 70-ton, 6-wheel standard gage, the other a 40-ton saddle tank, 4-wheel standard gage; three 30-ton Western all-steel, vertical-cylinder, air-drum cars; six steel hopper cars with a capacity of 50 tons, and a track footage of about 13,000 ft. of 85-lb. and 100-lb. rails. These tracks are so laid that all parts of the plant are reached; coal for use of shovels in quarry and explosives for primary blasts are delivered direct to the quarry floor; rip rap is loaded direct into railroad cars on the quarry floor, and service equipment such as the Browning locomotive crane and the electric welder, which is mounted on a standard-gage car, can reach all parts of the plant.

Storage Yard

Stone for storage is loaded from the bins into hopper cars which upon arriving at the storage yard are emptied into one of the five concrete pockets provided for the purpose. These pockets have a depth of 20 ft., are 30 ft. square and lie to the side of the tracks which are necessary for the operation of the 16-ft. gage crane. A plan of the storage yard is shown in Fig. 11.

The Orton and Steinbrenner 16-ft. gage locomotive crane having a bucket of 3 cu. yd. capacity, with its roadbed lying between the concrete pockets and the piles of stone, removes the stone from the pockets and throws it on its respective pile. Forty cars with a capacity of 50 tons may be loaded daily by this crane.

In loading stone from storage the 16-ft. crane is also assisted by a Browning locomotive crane of standard gage with a bucket of 1½ yd. capacity. Ten cars of 50 tons capacity may be loaded daily by this crane. Besides loading stone it also aids in the clearing up of stone piles, as it can reach the stone which flows out of the reach of the 16-ft. crane. The Browning crane is classed as service equipment, since it performs work for other departments throughout the year.

At present the handling of stone at the storage yard is undergoing a change. In the future the storage problem will be handled by a 15-ton Brownhoist, 30-ft. gage, electric portable crane which will have a 5-yd. bucket. The tracks for this crane will extend for about 800 ft. and will span the concrete pockets with the loading and unloading tracks for the railroad lying to one side of the pits. The piles of stone on both sides of the crane will be easily reached by means of its 100-ft. boom. It is expected that the shipping capacity of the plant will be increased 100 cars per day upon the completion of the work now in progress.

Power for the crane will be furnished through three single-rail conductors mounted on a 4-ft. concrete wall and connected with contact shoes to the crane. The 4-ft. concrete wall also acts as a retaining wall, thus increasing the storage capacity of the yard.

The crane will have the following electrical equipment:

2—100-hp., G.-E., slip-ring, variable speed, hoist motors operated with magnetic controls, dynamic and oil brakes; dynamic brake checks load. Oil brake holds load.
1—52-hp., G.-E., slip-ring, rotary motor magnetic controls; rotating.
1—52-hp., G.-E., slip-ring, travel motor, Drimi-type control.
1—52-hp., G.-E., slip-ring, boom hoist motor, Drimi-type control; magnetic brake.

The installation of this crane and the laying of the foundation is being done by the regular employes of the plant.

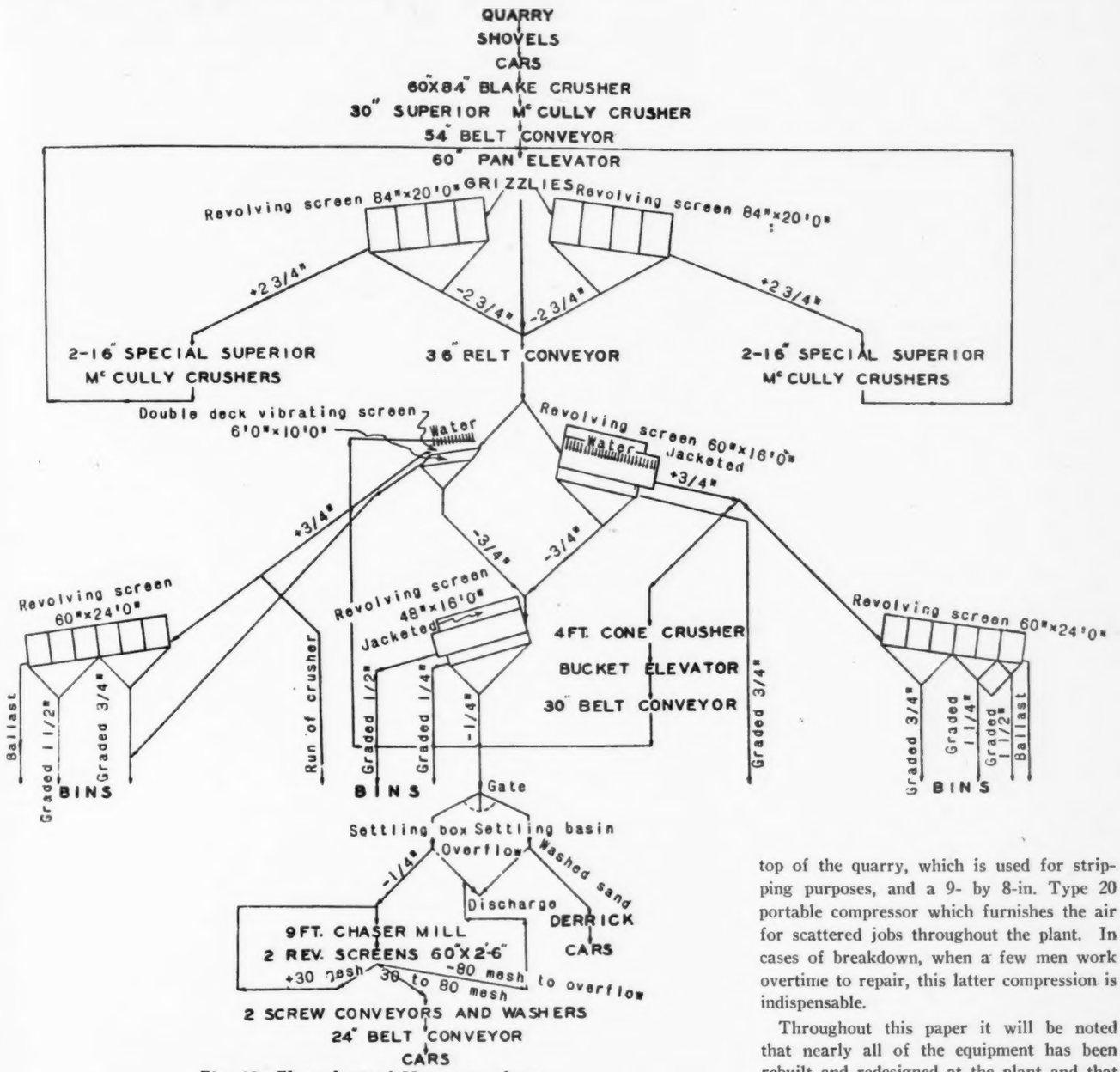


Fig. 10. Flow sheet of Monocacy plant

Another new addition which will take care of stone to be hauled by customers' trucks is the construction of a steel trestle equipped with eight 75-ton hoppers which will enable 24 trucks to be loaded at one time. This trestle was also fabricated and erected by the men regularly employed at the plant.

The stone is weighed on a 150-ton capacity scale, manufactured by the Standard Scale Co., by the shipping clerk who receives shipping instructions by telephone from the main office, located at Norristown, Penn., which are confirmed on the following day by mail.

Miscellaneous Departments of Plant

The expense of other equipment and facilities of the plant may be divided into two classes, service and general plant expense.

The service class includes air compression, machine, blacksmith, welding, Browning locomotive crane and caterpillar shovel, while the general plant expense consists of superintendence, general yard, hotel, quarry dwellings, truck and miscellaneous buildings cost.

The difference between these departments is that the service departments perform work for other departments, the costs of which can be distributed on the basis of man-hours, shovel-hours, etc., while the departments composing the general plant expense class also assist the other departments, but the costs cannot be allocated on any such basis.

Air is used for tunnel and secondary drilling, drill sharpening and general repairs. An Ingersoll-Rand PRE-2 air compressor of 1302 cu. ft. capacity driven by a 210-hp. synchronous motor furnishes the main source of air. In addition to this there is a 14- by 12-in. IR-1-JR air compressor, located on top of the quarry, which is used for stripping purposes, and a 9- by 8-in. Type 20 portable compressor which furnishes the air for scattered jobs throughout the plant. In cases of breakdown, when a few men work overtime to repair, this latter compression is indispensable.

Throughout this paper it will be noted that nearly all of the equipment has been rebuilt and redesigned at the plant and that many new additions in equipment are being erected by the regularly employed men at the plant.

To do this it is necessary to have a well-equipped shop and to employ mechanics who understand the requirements and rough usage that equipment is put to in quarry work. When new equipment is purchased it is watched carefully to observe the possible weak spots so that they can be reinforced. Each part of a machine is investigated to determine whether repairs could be made more economically by the shops or by outsiders. Patterns are made of some of the cast parts in order to save time when a replacement is necessary. At the present time 725 patterns of this sort are on hand, some of which have been made at the shops. These shops also do work for the two other quarries belonging to the company which are located nearby.

Maintenance and Repair Shops

Castings of pinions, car axles, wheels, pistons and piston rings, well drill stems, shafting, motor bearings, etc., are ordered in the rough and are machined to meet the requirements of the particular job.

Bolts from 5/8 in. to 3½ in. in diameter are made and threaded.

Drill steel is purchased in mill lengths, out of which drills of various lengths are cut.

Switch points, guard rails, crossovers and frogs for the plant's railroads are fabricated.

All quarry cars are rebuilt.

Practically all necessary machine work is done in the shops at considerable saving of time and money. Some examples of the work done follow:

Shaft on 60- by 84-in. primary crusher wore down to about 1 in. below size. Welders built the metal back to size.

Worn spiders on gyratory crushers have been built up, thereby saving a replacement.

Cylinder on locomotive has been rewelded and bored.

Crusher frames have been welded and rebored.

To carry on this work the shops are fitted out as follows:

WOODWORKING SHOP

1—Band saw; 36-in. adjustable table 32 by 27 in., throat 36-in., with saw guide belt driven by a 10-hp. motor. Crescent Machine Co.
1—Pneumatic drill for woodwork.
1—Rip saw table; 36- by 54-in. blade, 22-in. diameter, adjustable table with guide. Atlantic Iron Works.

MACHINE SHOP

1—Lathe; 42-in. swing by 18-ft. bed, double back geared, cone pulley drive, 10-hp. motor, silent chain drive. Schumacher and Boyd.
1—Lathe; 28-in. swing by 26-ft. bed, double back geared, quick change gear, taper attachment, two face plates, two steady rests, one following rest, chuck, countershaft. Schumacher and Boyd.
1—Planer; 30-in. by 10-ft. open side, horizontal and vertical heads, 10-hp. motor on bracket No. 543. Detrick and Harvey Machine Co.
1—Shaper; 22-in., 5-hp. G. E. motor, direct. Stockbridge.
1—6-ft. radial drill; 10-hp. motor, direct. Dresser Manufacturing Co.
1—Lathe; 16-in. swing by 8-ft. bed, double back geared, cone pulley drive, 5-hp. motor, silent chain drive. F. E. Reed Co.
1—Planer chuck; 13-in. Skinner.
1—Bench vise No. 289½; 6-in. jaws, combination jaw and pipe vise with swivel base. Charles Parker Co.
1—Drill press No. 1029; 34-in. back geared, positive feed, pulley drive, driven by a 5-hp. G. E. motor, silent chain drive. W. F. and G. Barnes Co.
1—Grinder; double-disk, 14-in. diameter, 2-in. face.
1—Chain hoist; 10-ton, Yale and Towne Manufacturing Co.
1—Hoist, electric portable; 5-ton. Roeper.
1—Pipe threading machine, No. 3; capacity of 1½-in. to 6-in. pulley drive, 5-hp. motor, silent chain drive. Williams Tool Co.
2—Trolley runways; 4-wheel trolley.

BLACKSMITH SHOP

2—Furnaces; 1 oil, 1 coal.
1—Grinder; double-disk, 14-in. diameter, 2-in. face.
1—Drop hammer; pneumatic, 2-in. by 16-in.
1—Jib crane; with trolley for 5-in. I-beam.
1—Shank and bit punch; Leyner-type IR-133.

WELDING SHOP

1—Electric welding outfit; mounted on standard-gage railroad car; generator set, 500-amp., 3 welders.
2—Oxygen-acetylene cutting outfits.
1—Punch or shear; single cap, 1½-in. throat, 55-in. No. 16081, type T244; direct-connected through gears to 5½-hp. motor. Long and Alstatter.

PORTABLE EQUIPMENT

1—Portable boring bar. Cincinnati Machine and Supply Co.
1—Electric portable drill; ½-hp. motor. Black and Decker.
2—Corner pneumatic drills. Thor.
1—Electric portable grinder, No. 90158, with ⅓-hp. motor. Van Dorn.
1—Key seater, No. 2. Burr.
2—Pneumatic riveting hammers. No. 90, "Little David." Ingersoll-Rand Co.

The personnel of these shops is as follows: 4 machinists, 2 blacksmiths, 3 welders.

The overhead costs of the various jobs performed by these departments are distributed on the basis of man-hours. All labor and material are charged directly to the job.

Power

Electric power is purchased through the Associated Gas and Electric Co., and all parts of the plant are reached by the power lines. The kilowatt hours consumed are spread over the various departments, except crushing and screening, on the basis of the rated horsepower, taking into consideration the number of hours each motor operated during the month and charging the balance to crushing and screening. These figures are checked from time to time by placing a meter on each department, the electrician's time being charged direct to the job upon which he and his helpers are working.

Since the Browning locomotive crane and caterpillar shovel have been previously explained nothing need be said at this point other than that the costs of operating are distributed over the various jobs upon which they work on the basis of crane or shovel hours. Depreciation is included.

General Plant Expense

Superintendence — Superintendence includes the salary of the superintendent, quarry clerk, all costs in connection with the safety program and engineering.

General Yard—The general yard expense includes the costs of keeping the plant clean as a whole and any costs which cannot be definitely allocated to a particular job.

Hotel—The hotel or boarding house provides the men who desire it with their dinner at a cost to them of $0.35 per meal, the company shouldering the balance of the costs. This scheme has repaid the company in more ways than one, as it provides a place for the men to meet and eat, thereby bringing about good fellowship. The men can get a meal in inclement weather and in cases of overtime, due to breakdowns, the men are willing to work late, knowing that they can secure a hot meal at the company's expense. The hotel also provides food for the company's annual outings when the three plants vie with one another for supremacy in athletic events.

Quarry Dwellings—In the vicinity of this plant there are 27 dwellings which are owned by the company and are rented to the employes at a nominal cost, the excess costs being absorbed by the company.

Truck—A Reo truck hauls the freight for the plant, carries the men to and from work and does odd jobs in and about the plant.

Miscellaneous Buildings—The buildings grouped as miscellaneous are those in which material, spare parts and patterns are stored.

Group and Health Insurance—After an employe has been with the company six months he is eligible for both group and health insurance without taking a physical examination.

The premiums on the group insurance are paid by the company, the amount of the insurance starting with $500 and increasing $100 every year the employe is with the company until the maximum of $5000 is reached.

The premiums on health insurance are paid by the employes themselves. An amount of $1 per month entitles them to $13 per week sick benefits for 13 weeks after the first three days' sickness.

Supplies

All supplies except coal, explosives and gasoline are charged direct to the department for which the supplies are to be used. The quarry clerks upon ordering such material insert on the requisition the accounts to which the material is to be charged.

Coal, explosives and gasoline are inventoried and the quarry clerk reports at the end of each month the amount received during the month, the quantity used during the month, where used and the balance on hand at the end of the month.

In addition, an inventory report is also sent to the main office showing tons of rock shot down during the month, tons of rock removed from quarry floor during month, tons of rock remaining on quarry floor, holes drilled and used during month, balance on hand at the end of the month, tons of stone placed in and taken out of storage during the month and balance of crushed stone on hand at the end of the month. A stripping report is also rendered at the end of each month.

To insure regular deliveries of coal, a standing order is usually placed with the vendor to deliver a certain number of cars weekly. This order is changed from time to time according to the demands of the plant.

Co-ordination of Operations

Communication between the different departments is made by means of telephones which are conveniently placed in the quarry office, scale house, machine shop and hotel. In cases of breakdowns in departments where there are no telephones, communication between departments is made by means of signals.

The ratio of stone sold to stone broken from solid is about 98%; 2% is lost through washing. All of the stone is sold as crushed stone except in a few isolated cases when one- and two-man stone is sold.

All of the employes are paid on an hourly basis except well drillers, the superintendent, quarry clerks and the night watchman. Well drillers are paid an hourly rate with a bonus of 25 c. per ft. for all footage drilled in excess of 100 ft. per month.

During the year 1929 this plant operated

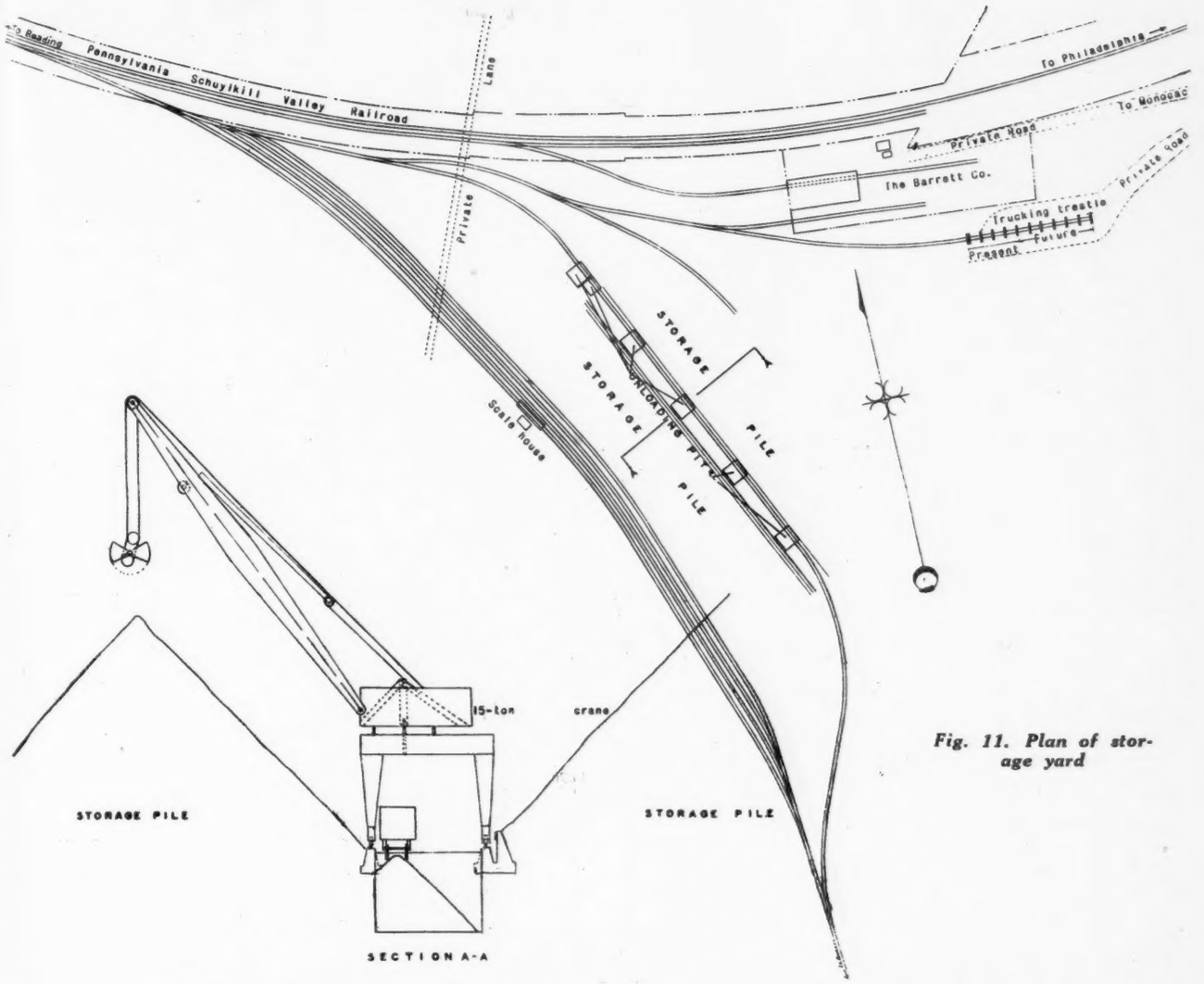


Fig. 11. Plan of storage yard

283 days, averaging 55 hours per week and making a total of 223,240 man-hours. The average hourly wage was $0.54¼.

Safety Methods

Definite steps toward the formation of a safety organization were first taken in 1926, when a safety committee was appointed. This committee consists of the superintendent, clerks and foremen in charge of the various operations. Meetings are held monthly, at which time inspectors' reports are read and discussed, means of preventing accidents that happened during the previous month are considered and any changes or additions which might be made to improve the safety of conditions or machines about the plant are formulated. The company also employs a safety engineer who attends all of the meetings.

Early in 1928 the company started a safety competition among the three plants. The one having the best record each year has its name inscribed on a bronze plaque. The competition will continue for five years and at the end of this time the plant having its name on the trophy the greatest number of times will keep the trophy permanently.

The accident record of this plant since 1928 is as follows:

Year	Frequency rate	Severity rate	Man-hours
1928	87.59	18.70	219,417
1929	35.87	0.26	223,240
1930 (first 7 mo.)	7.82	0.04	127,809

Administrative Organization

The superintendent is in complete charge of all operations and of appointing foremen to supervise departments. A foreman is placed in charge of each group as shown:

		Number of men
1.	Stripping	2
	Well drilling	2
2.	Tunnel drilling	4
	Secondary drilling	10
	Loading to quarry cars	7
	Transporting to crusher	7
3.	Crushing and screening	8
4.	Main railroad	8
	Scale house	1
	Ground storage	2
	Browning crane	2
	Caterpillar shovel	2
5.	Power	2
	Air compression	1
6.	Machine shop	6
7.	Blacksmith shop	2
8.	Welding shop	4
9.	General plant administrative	3
	General yard	2
	Truck	1
	Hotel	1
	Dwellings	0
		78

Foremen Have Club for Monthly Discussion

About two years ago the foremen of the different departments organized a club, which they named the Progressive Club, for the purpose of meeting monthly to discuss the many problems which they encounter in their respective departments and to provide ways and means of reducing costs. These meetings are held on the men's time, the attendance not being compulsory. A new member is admitted to the club after his name has been presented by one of the members and approved by all. Members showing lack of interest through non-attendance are notified that they are no longer members. Three members have been admitted and none dropped since the organization of the club.

At each meeting every member is given an analysis of his departmental costs during the previous month, which shows a unit cost per hour, ton or on whatever basis his department costs are figured, and is given an opportunity to question any item appearing thereon.

After the costs are discussed a mock trial is held. One member, whose name has been

drawn by lot the previous month, is charged with doing things in and about the plant which may or may not be true. The idea is to give the members something to talk about, bringing things to their attention which they ordinarily would not see and at the same time to bring before each foreman the problems of the other foremen. To prevent the bringing up of charges of a personal nature, the charges are drawn up by the cost accountant, who together with the superintendent, quarry clerk and safety engineer attend all meetings.

Engineering

The engineering staff, which consists of two engineers and two assistants, performs all of the engineering work for the three plants which are in operation and cares for all other property owned by the company.

Cost Details

THE tabulations which follow give practically complete figures of the cost of operation of this plant for a year, and the distribution of the various items per ton of stone produced.

SUMMARY OF COSTS AT THE MONOCACY QUARRY, 1929
TOTAL MATERIAL LOADED DURING 1929
Overburden, 16,202 cu. yd. dirt. Production stone, 441,915 short tons

Name of account	1 Labor	2 Supervision	3 Air drills, steel	4 Power cost	5 Fuel cost	6 Explosives	7 Other supplies	8 Total
Stripping (cu. yd.)								
Drilling	$0.0960	$0.0015	$0.0080	.....	$0.0253	.....	$0.0022	$0.1330
Blasting	.....	.....	.....	.....	.....	.....	.....	.....
Loading	.1665	.0025	.....	.....	.0940	.....	.0630	.3260
Transportation	.1564	.0024	.....	.....	.0316	.....	.0198	.2102
	$0.4189	$0.0064	$0.0080	.....	$0.1509	.....	$0.0930	$0.6692
Stripping (per ton stone produced)								
Drilling	$0.0035	$0.0001	$0.0003	.....	$0.0009	.....	$0.0001	$0.0049
Loading	.0048	.0001	.....	.....	.0013	.....	.0015	.0077
Transportation	.0068	.0001	.....	.....	.0032	.....	.0018	.0119
Mining (per ton stone produced)								
Drilling (primary)	.0144	.0001	.....	$0.0017	.....	.....	.0023	.0185
Drilling (secondary)	.0101	.0022	.0006	.0163	.....	.....	.0002	.0294
Blasting (primary)	.0002	.....	.....	.....	.....	$0.0208	.....	.0210
Blasting (secondary)	.0041	.0001	.....	.....	.....	.0200	.0003	.0245
Loading	.0420	.0066	.....	.....	.0098	.....	.0193	.0777
Transportation	.0218	.0034	.....	.....	.0072	.....	.0061	.0385
Crushing (primary)	.0262	.0054	.....	.0292	.....	.....	.0291	.0899
Crushing (secondary)	.0145	.0032	.....	.0162	.....	.....	.0162	.0501
Screening	.0043	.0017	.....	.0048	.....	.....	.0039	.0147
Elevating	.0015	.0002	.....	.0016	.....	.....	.0016	.0049
Conveying	.0017	.0003	.....	.0019	.....	.....	.0019	.0058
Washing	.....	.....	.....	.....	.....	.....	.0007	.0007
Sand	.0048	.0008	.....	.0027	.....	.....	.0020	.0103
*Storage (in)	.0257	.0037	.....	.....	.0150	.....	.0070	.0514
Storage (out)	.0256	.0034	.....	.....	.0150	.....	.0064	.0504
Miscellaneous plant	.0264	.0012	.....	.....	.0025	.....	.0308	.0609
Total operating	$0.2384	$0.0326	$0.0009	$0.0744	$0.0549	$0.0408	$0.1312	$0.5732

*Storage includes transportation.

SUMMARY OF COSTS IN UNITS OF LABOR, POWER AND SUPPLIES,
MONOCACY QUARRY, 1929
MATERIAL LOADED DURING 1929
Overburden, 16,202 cu. yd. (weight per cu. yd., loose measure, 2000 lb.)
Production, 441,915 short tons (weight per cu. yd., loose measure, 2700 lb.)

	Percentages				
	Stripping	Mining	Crushing	Other	Total
A. Labor (man-hours per ton stone):					
Drilling	.....	$0.0384	.....	.....	$0.0384
Blasting	.....	.0023	.....	.....	.0023
Loading	$0.0155	.0398	.....	$0.0162	.0715
Haulage	.0072	.0308	.....	.0330	.0710
Miscellaneous	.....	.0368	$0.0883	.1323	.2574
Supervision	.0005	.0254	.0150	.0237	.0646
Total labor	$0.0232	$0.1735	$0.1033	$0.2052	$0.5052
Average tons per man per shift	431	57.6	96.8	48.7	20
Labor, percentage of total cost	.....	.....	.....	.....	31.13
B. Power supplies:					
Explosives (lb. per ton)	.....	.3112	.....	.....	.3112
Total power (kw.h. per ton):					
1. Shovels	.....	.....	.....	.....	.....
2. Locomotives	.....	.....	.....	.....	.....
3. Air compression	.....	.2420	.....	.2160	.4580
4. Drills	.....	.0317	.....	.....	.0317
5. Pumping	.....	.....	.....	.....	.....
6. Crushing	.....	.....	1.7782	.....	1.7782
7. Screening	.....	.....	.1880	.....	.1880
8. Elevating	.....	.....	.0627	.....	.0627
9. Conveying	.....	.....	.0744	.....	.0744
10. Sand	.....	.....	.1029	.....	.1029
11. Drying	.....	.....	.....	.....	.....
12. Storage	.....	.....	.....	.....	.....
13. Shops	.....	.....	.....	.3211	.3211
14. Lighting	.....	.....	.....	.0212	.0212
Fuel (tons of coal per ton)	.007	.035	.....	.063	.105
Other supplies in percentage of total supplies and power	.....	.....	.....	.....	43.71
Supplies and power, percentage of total costs	.....	.....	.....	.....	39.46
C. Percentage of total cost	.....	.....	.....	.....	70.58

DETAILED AVERAGE SHOVEL COSTS, DIRECT OPERATION, MONOCACY QUARRY, 1929

OSGOOD 29

Type of shovel, caterpillar
Size of dipper, 1-yd.
Tons of overburden loaded, 8101; cu. yd., 16,202
Tons of stone uncovered, 441,915
Tons of stone loaded, none

	Amount	Cost per ton—Waste	Cost per ton—Stone uncovered
Shovel operation:			
Engineer	$ 1,051.15	$0.1298	$0.0024
Fireman	875.95	.1081	.0020
Other operating labor	350.38	.0433	.0008
Total operating labor	$ 2,277.48	$0.2811	$0.0052
Fuel	$ 1,418.25	$0.1751	$0.0032
Grease and lubricants	32.33	.0040	.0001
Coal, crane expense	104.16	.0129	.0002
Other operating supplies	107.01	.0132	.0002
Total supplies	$ 1,661.75	$0.2051	$0.0037
Shovel repair labor	$ 420.23	$0.0519	$0.0010
Shop labor	281.96	.0348	.0006
Repair supplies	66.95	.0083	.0002
General overhauling	532.62	.0657	.0012
Total repairs	$ 1,301.76	$0.1607	$0.0030
Total shovel operation	$ 5,240.99	$0.6470	$0.0119
Drilling:			
Operating labor	$ 1,401.53	$0.1730	$0.0032
Gas	410.47	.0507	.0009
Operating supplies	106.96	.0132	.0002
Repair labor	154.23	.0190	.0003
Repair supplies	57.43	.0071	.0001
Total drilling	$ 2,130.62	$0.2630	$0.0048
Haulage:			
Locomotives	$ 2,102.29	$0.2595	$0.0048
Cars	511.30	.0631	.0012
Track maintenance	431.22	.0532	.0010
Dump maintenance	322.11	.0398	.0006
Total haulage	$ 3,366.92	$0.4156	$0.0076
General charges	$ 103.46	$0.0128	$0.0002
Grand total	10,841.99	1.3384	.0245
Cost per ton, all material		1.3384	.0245

DETAILED AVERAGE COSTS, DIRECT OPERATION MONOCACY QUARRY, 1929—PRIMARY DRILLING, 1420 FT.—WELL DRILL

	Amount	Cost per ton
Primary drilling:		
Labor operating	$ 4,225.70	$0.0096
Power	746.05	.0017
Labor repairs	2,073.26	.0047
Material repairs	157.55	.0004
Tools and miscellaneous supplies, etc.	386.21	.0009
Shops	477.16	.0010
Lubricants	28.12	.0001
Supervision	24.30	.0001
	$ 8,118.35	$0.0185
Primary blasting:		
Labor operating	$ 81.38	.0002
Explosives	9,191.83	.0208
	$ 9,283.21	$0.0210
Summary:		
Total stripping costs	$10,841.99	$0.0245
Total drilling primary costs	8,118.35	.0185
Total blasting primary costs	9,283.21	.0210
Total cost rock on quarry floor	$28,243.55	$0.0640
Secondary drilling:		
Labor operating	$ 4,108.14	$0.0093
Air	7,199.45	.0163
Operating supplies	90.38	.0002
Repair labor	361.44	.0008
Supervision	972.21	.0022
Repair supplies	254.21	.0006
	$12,985.83	$0.0294
Secondary blasting:		
Labor operating	$ 1,808.13	$0.0041
Explosives	8,852.57	.0200
Supervision	44.19	.0001
Other supplies	145.46	.0003
	$10,850.35	$0.0245

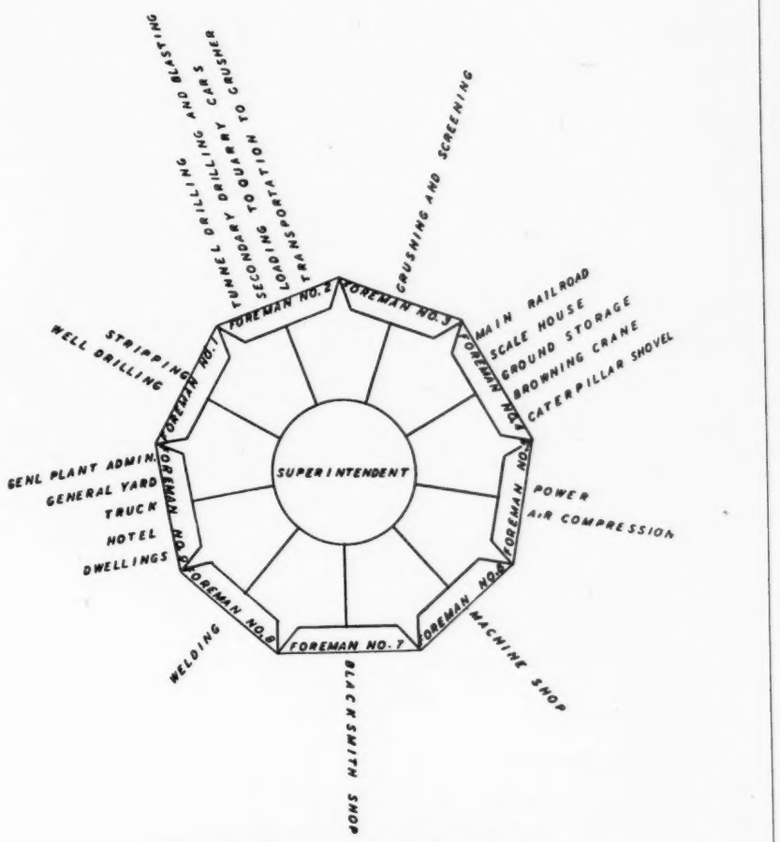


Fig. 12. Quarry organization chart

DETAILED AVERAGE COSTS, DIRECT OPERATION, MONOCACY QUARRY, 1929

MARION OSGOOD 120; BUCYRUS 95C

Type of shovels, steam railway
Size of dippers, 4-yd.
Tons of stone loaded, 441,915

	Amount	Cost per ton
Engineers	$ 3,394.43	$0.0077
Cranemen	2,588.26	.0059
Firemen	2,144.17	.0049
Pitmen	783.53	.0018
Total operating labor, etc.	$ 8,910.39	$0.0203
Fuel	$ 3,695.04	$0.0083
Grease and lubricants	73.84	.0002
Coal crane expense	649.83	.0015
Other operating supplies	260.26	.0006
	$ 4,678.97	$0.0106
Shovel repair labor	$ 4,725.07	$0.0107
Shops	1,185.97	.0026
Repair supplies	2,880.11	.0065
General overhauling	4,121.04	.0093
Supervision	2,916.64	.0066
	$15,828.83	$0.0357
Total shovel operations	$29,418.19	$0.0666
Labor other than shovel	4,904.65	.0111
Secondary drilling:		
Labor operating	4,108.14	.0093
Air	7,199.45	.0163
Operating supplies	90.38	.0002
Repair labor	361.44	.0008
Supervisor	972.21	.0022
Repair supplies	254.21	.0006
	$12,985.83	$0.0294
Secondary blasting:		
Labor	$ 1,808.13	$0.0041
Explosives	8,852.57	.0200
Supervision	44.19	.0001
Other supplies	145.46	.0003
	$10,850.35	$0.0245

DETAILED AVERAGE COSTS, DIRECT OPERATION, MONOCACY QUARRY, 1929

	Amount	Cost per ton
Haulage to crusher:		
Labor operating	$ 4,235.06	$0.0096
Fuel	2,842.97	.0064
Labor repairs—roll stock	3,214.15	.0073
Material repairs—roll stock	936.73	.0021
Labor, maintenance of way	2,177.68	.0049
Material, maintenance of way	407.65	.0009
Miscellaneous supplies	411.26	.0009
Lubricants	89.39	.0002
Shop repairs	883.08	.0020
Supervisor	1,502.51	.0034
Coal crane expense	357.01	.0008
	$17,057.49	$0.0385
Crushing, washing, screening:		
Labor operating	$ 8,015.05	$0.0180
Power	23,769.50	.0537
Labor repairs	13,340.76	.0302
Material repairs	16,723.38	.0378
Tools and miscellaneous supplies	1,392.24	.0031
Lubricants	1,811.85	.0041
Water rights	300.00	.0007
Shops	3,404.78	.0077
Supervision	4,772.68	.0108
	$73,530.24	$0.1661
Sand storage:		
Labor operating	$ 979.75	$0.0022
Power	1,193.87	.0027
Labor repairs	1,158.97	.0026
Material repairs	304.50	.0007
Tools and miscellaneous supplies	204.23	.0005
Shops	365.76	.0008
Supervision	366.01	.0008
	$ 4,573.09	$0.0103

DETAILED AVERAGE COSTS, DIRECT OPERATION, MONOCACY QUARRY, 1929

Shipments, 426,725 tons

	Amount	Cost per ton
Railroad—direct shipments: or ground storage:		
Labor operating	$ 4,383.93	$0.0103
Fuel	6,248.65	.0146
Labor repairs—roll stock	3,598.06	.0084
Material repairs—roll stock	246.28	.0006
Labor, maintenance of way	1,670.91	.0039
Material, maintenance of way	236.91	.0006
Tools and miscellaneous supplies	247.25	.0007
Lubricants	105.53	.0002
Shops	1,107.08	.0026
Crane expense, coal	128.80	.0003
Supervision	1,450.87	.0034
	$19,424.27	$0.0456
Scale house:		
Labor operating	$ 6,792.07	$0.0159
Labor repairs	123.60	.0003
Material repairs	2.39	.....
Miscellaneous supplies	241.41	.0006
	$ 7,159.47	$0.0168
Ground storage:		
Labor other than 16-ft. crane	$ 2,653.53	$0.0062
16-ft. gage crane:		
Labor operating	$ 1,609.97	$0.0038
Fuel	2,324.34	.0054
Labor repairs	1,074.20	.0025
Material repairs	596.34	.0014
Tools and miscellaneous supplies	2,070.83	.0049
Lubricants	93.52	.0002
Shops	449.19	.0011
Supervision	1,578.88	.0037
	$ 9,797.27	$0.0230
Browning locomotive crane (service)	$ 4,507.53	$0.0102
Total shipping expense	$43,542.07	$0.1018
Tons moved in ground storage	318 460	
Tons moved out ground storage	294 499	
Total tons moved	612,959	

SUMMARY OF DETAILED AVERAGE COSTS, DIRECT OPERATION MONOCACY QUARRY, 1929

	Amount	Cost per ton
Stripping costs	$ 10,841.99	$0.0245
Primary drilling	8,118.35	.0185
Primary blasting	9,283.21	.0210
Total cost of rock on quarry floor	$ 28,243.55	$0.0640
Secondary drilling and blasting	23,836.18	.0539
Loading to crusher	34,322.84	.0777
Hauling to crusher	17,057.49	.0385
Crushing, washing, screening	73,530.24	.1661
Sand	4,573.09	.0103
Miscellaneous plant	26,912.62	.0609
Total cost at crusher	$208,476.01	$0.4714
Shipping expense:		
Railroad, direct to storage	$ 19,424.27	$0.0456
Scale house	7,159.47	.0168
Ground storage	16,958.33	.0394
Total shipping expense	$ 43,542.07	$0.1018
Total operating costs	252,018.08	.5732

NOTE: Cost per ton units are based on production (441,915 tons) up to and including "total cost at crusher." Cost per ton units are based on shipments (426,725 tons), including "total shipping expense."

Driller's Handbook

A NEW 122-page driller's handbook just published gives interesting information on rock drills and ways of getting best results from them, along with tables and data on pipe sizes, air flow in pipes, required compressor capacity, etc.

Chapters are devoted to lubrication, operating, care of shanks and bits, hose and couplings, modern rock drill types and explosives and blasting.

The book is published by the Cleveland Rock Drill Co., 3734 East 78th street, Cleveland, Ohio, and is available to operators.

Lime Production Methods of Europe and America

Part II—Being Mostly Prophecies and Criticisms

By Victor J. Azbe
Consulting Engineer, St. Louis, Mo.

IN THIS European-American comparison I want to avoid creating the impression in the minds of readers that every American plant is out of date and that no effort is made towards correction. At one time in the past, I had the feeling that this was almost the case and felt that the technical progress of the industry was at a standstill. I now know differently! There is progress, but it is so slow, observation over a long time period is needed to measure it. In a way, one may say that it is just as well that changes were not introduced at a greater rate heretofore; because, due to lack of very essential fundamental scientific knowledge, the "improvements" would quite likely have turned into "mistakes." There is even much of this now. To many lime men the lime kiln is still a hole surrounded by brick walls; and pet ideas are introduced that fail absolutely when subjected to any mathematical analysis.

If we pick up the earlier *Transactions* of the National Lime Association, we find therein discussions of kilns which are of a kindergarten nature, in the present light. Today it is somewhat different; and the coming twenty-five years will see the elimination of most inefficient kilns, excepting possibly only a few that will be used intermittently during peaks of production demand.

To Be and Not to Be!

Plants of the nature shown in Fig. 22 will disappear, to be supplanted by such as exemplified by Figs. 23 and 24. Hand firing will be as scarce as is now the case in Europe; because, no matter how expertly hand firing is done, it can never be as efficient as gas firing; and particularly it can never be as efficient as the mixed-feed method.

Clouds of smoke are invariably the result with hand firing, and what is far worse the smoke is accompanied by carbon monoxide causing a serious loss of heat. Some day in the future smoke obliterated plants like those shown in Figs. 25 and 26, still so common today, will not exist; and one will encounter plants probably of much higher output, which will create the impression of being shut down due to complete absence of smoke. Fig. 27 is a view of a plant that is an indication of the future, the small old kilns producing 30 tons of lime per day each, while the large kiln is producing 60 tons with hardly a wisp of black smoke. In the old days, this plant smoked as badly as any; and fuel ratios were always below three to one; while now, they are always considerably over four to one, even though comparatively low grade fuel is burned.

There has been a gradual evolution. In one plant some years ago the operators substituted for the hand-fired kilns of Fig. 28, the gas-fired type of Fig. 29. It is true that in the present light these kilns are also obsolete; but then, while they were installed long ago, they are still far more modern than many in operation in other plants today. Then also, progress is always a question of evolution and these small gas kilns are a link between the distant past and today; while the kilns built today are merely the link between today and the future. I have designed kilns, but never yet one to my satisfaction. Every improvement should lead to another, and the more willing the lime plant owners and their engineers are to keep an open mind, receptive to suggestion for logical changes, the better. We now are in the days of uncertainty; many questions confront us, such as: Should this be thus, or that? Should the kiln be 30 or 100 ft. high? Should it make 10 tons of lime per day or 250 tons?

Although Schmattolla has never received much credit, he did a tremendous amount of good in this country. It is from some of his kilns that I learned the initial secrets of capacity. It was he who had the daring to build for those days monstrously large-sized kilns. They are large even for the present days. For example, the gas kiln of the Warner Co. has a shaft 7x16 ft. in area, or the kilns of Louisville Cement Co. with shell diameters of 24 ft. and each kiln with two shafts each 5x15 ft. in area.

The kilns of the former Security Lime and Cement Co., built about 1907, each producing 60 tons, were also path breakers. While today, their ratio of 4½ to 1, when compared with the latest, is not so particularly good any more, yet compared with some plants still in operation having ratios of 2½ to 1, it certainly is remarkable.

Large Kilns Predicted

In the future, kilns of 8 or 12 tons capacity will be taboo. They will be of 50 tons and more for gas kilns, and of 100 tons and more for mixed-feed kilns. Fig. 32 shows the contrast of the small, inefficient kiln producing only a few tons of lime per day and the several-times-larger kiln producing many times as much—say seven or eight times more lime.

Editor's Note

NO promise was made, when the first article of this series was published in our issue for December 6, 1930, that any close continuity of the series would be maintained. Mr. Azbe has many demands on his time and can write only as he finds opportunity, while the editor has special demands on his space which must be met. We know from experience, however, that a series by Mr. Azbe does not lose its grip on the reader, however prolonged may be the gaps between installments.

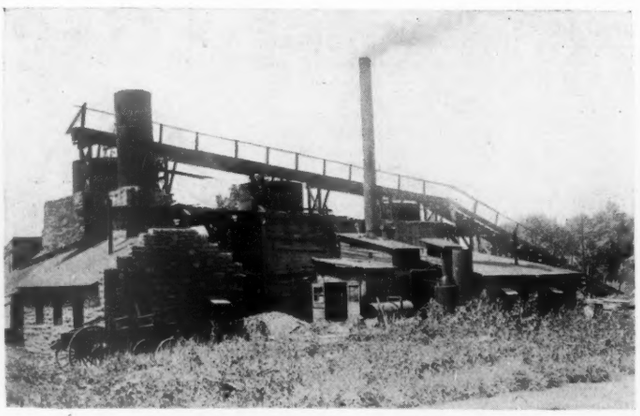
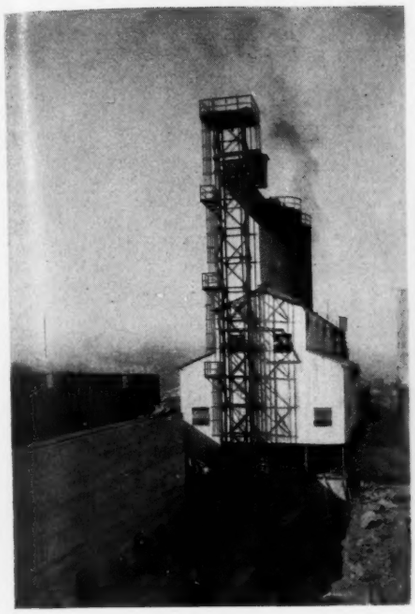
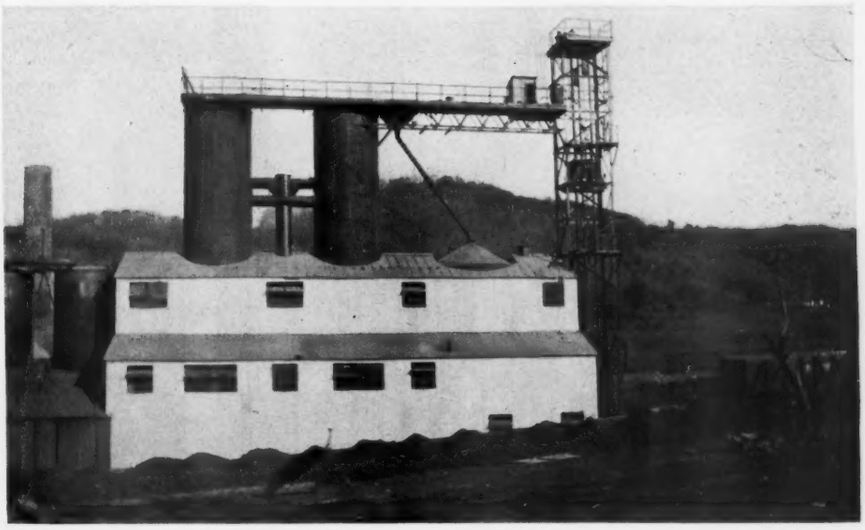


Fig. 22. Contrast this obsolete, inefficient type of kiln with the modern design shown in Figs. 23 and 24





Figs. 23 and 24. Some examples of American lime kilns which represent most modern practice

With such kilns, making high calcium lime, a ratio of five to one and a fuel cost considerably below a dollar per ton is quite readily possible, while with high magnesium limestone a ratio of six to one and proportionately lower fuel costs are to be expected. What is more, with such kilns the advantage of the lower labor cost of rotary kilns will disappear, since two 60-ton vertical kilns will require no more or even less labor than a 120-ton rotary kiln. There are many who think that such large kilns will lack flexibility, but then there is no reason why, when not wanting 60 tons, one could not, by adjusting the draft and the fuel, reduce the capacity to 30 tons and so vary the capacity up and down as the load of a boiler can be varied.

Progress is impossible without exact information, and no one man, no matter how thoroughly he knows his own plant, can get sufficient information from that source alone to fully improve his plant. He may have ideas, he may try them out, he may improve his plant somewhat, but as likely as not, he may not improve it. What he needs is the sum total of knowledge of the industry, the results not of one or two of his own experiments but of the hundreds made by all the other progressive plant operators, with the whole boiled down into an available, readily applicable form. We, in America, have no such control source of information.

Needed Study of Operating and Production Problems

In the ten years I have dabbled with lime, I don't remember exactly how many active heads our National Lime Association has had but I think five; which, by itself, is sufficient to indicate the instability of the organization. The German Lime Association, on the other hand, presents the picture of solidarity. It is thoroughly organized, with work and research systematized and the whole directed towards the solution of perplexing problems that all industries are subject to. The association has its own home, Fig. 34. Its general manager, Herr Urbach, (Fig. 35) has directed the association's activities for many years. Under him are many departments, all prolific in results. To us here a most interesting department is the lime manufacturing department, under the direction of Gerhardt Seeger, the young but very energetic and thoroughly well-posted chief engineer (Fig. 36).

Of course, in the days of its greatest activity our American lime association accomplished much also, but not along lines of efficient production. Take the matter of a proper refractory for a lime kiln. What should it be, ordinary good grade of fire brick, or high silica, or high alumina brick, or quartz, or carborundum, or sintered magnesite, or corrundum, or what? What is the chemistry, or the physics, of the attack of lime on the kiln lining? What we know about it is almost nothing. The lime men try this and they try that, just as some people doctor themselves with patent medi-

Figs. 25 and 26. Clouds of smoke are the inevitable result of hand-firing, still so common today in the United States

Fig. 28. Old hand-fired kilns

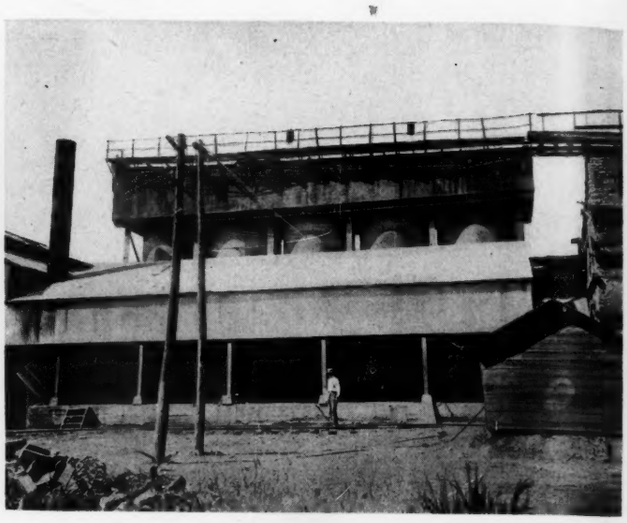


Fig. 29. Gas-fired kilns were substituted

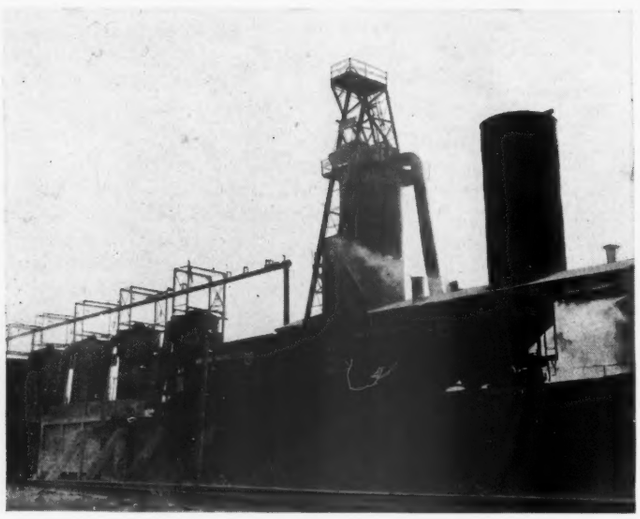


Fig. 27. Old kilns, producing 30 tons each per day, and new kiln producing 60 tons

cines. In Germany, a very thorough and illuminating study was made of the subject, about which more will be said in this series later on.

Herr Seeger and his engineers made studies of many lime kilns, and then they started improving them with some remarkable results. A ring kiln that previously made 150 tons of lime had its capacity increased to 250 tons. At the same time, the fuel consumption was reduced from 25% to 20%, that is, from a ratio of four to one to five to one. A mixed-feed vertical kiln was converted from natural draft to forced draft and the capacity increased from 44 tons per day to 115 tons per day, with the simultaneous bettering of the fuel ratio from 4.2 to 1 to 5.2 to 1. This kiln, during the run, had put out 44,000 tons of lime, and continued with the lining still good.

Then, they built some kilns which were original in design, to quite an extent, of which one is shown in Fig. 37. This kiln produces 110 tons of lime per day. It is 135 ft. high, but this partially due to a peculiarity that under the kiln directly is a storage silo having a capacity of 110 tons of lump lime and 65 tons of fines. The entire system is automatic—automatic charging of the kiln, automatic drawing of the lime from the kiln into the silo, as well as from the silo on the way to be loaded into the car.

This production department was organized by the German Lime Manufacturers' Association in 1919, at the end of the war when so many coal mines were taken away from Germany, and they found that they had to be particularly saving in the use of fuels. The department is self-sustaining, that is, every manufacturer who subscribes to the service, pays his proportionate share. It costs nothing to the manufacturers who are also members of the association but who do not care to make use of this service. Only those who directly benefit pay. Even though the department is self-sustaining, it is debatable whether it should compete with outside organizations in the actual design and installation of kilns. In Europe there are quite a number of engineering organizations building excellent lime kilns, some according to their own patents. Those located in Germany support the German

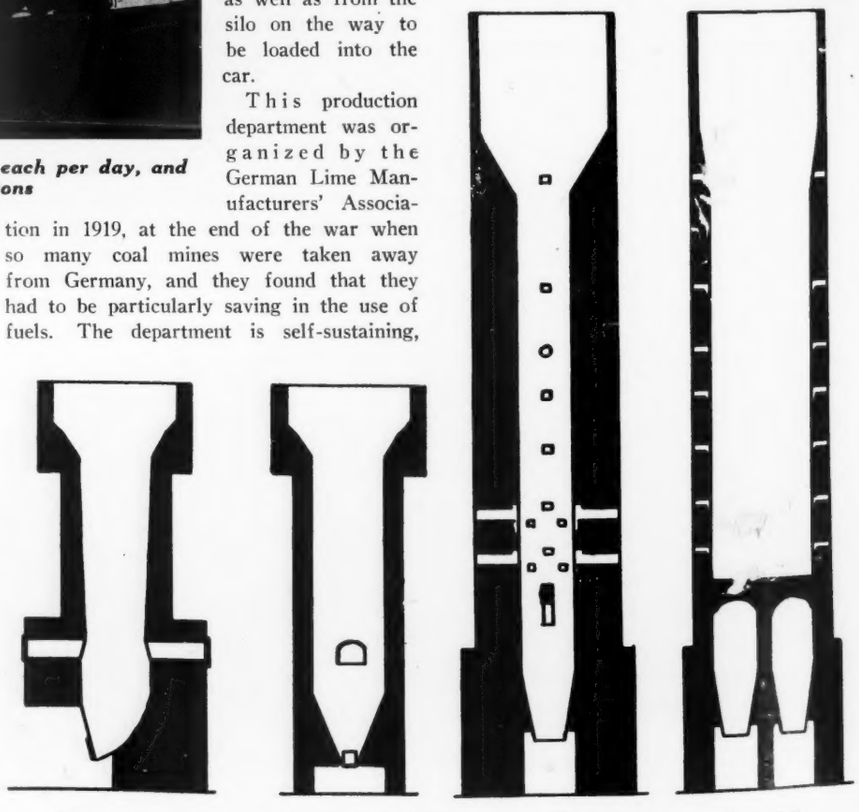


Fig. 32. Contrast of the small, inefficient kiln with the larger modern kiln

Fig. 35. Herr Urbach, general manager, German Lime Manufacturers' Association

Lime Manufacturers' Association through dues as associate members; yet a department of the association is in direct competition with them; which, quite naturally, they don't like. One would think such a production department would be of even greater value if it confined its work to testing studies and recommendations, thus occupying a position in which it would remain entirely unbiased.

Some Things Our Lime Association Should Do

If our own lime association would have a capable department of this nature, which would serve those manufacturers willing to make use of the services and willing to pay for it, from the many plants served a large amount of information would be collected and out of this information would gradually crystallize the ideal lime kiln and lime plant capable of producing uniformly burned lime cheaply from the labor, fuel and upkeep standpoint. Now, some of our lime manufacturers are opposed to any such interchange of information. They probably think, they themselves have something special, and so don't care to share with others; a selfish view by which they harm themselves, since quite certainly what they have is nothing compared with what they should have in a true modern sense. Their fear of sharing just helps to keep the entire industry in the dumps—a most unfortunate situation.

To my mind, the National Lime Association should have on tap all available information on the subject of lime, gathered from all over and continually added to and correlated. Not only some phases of it, but all of it, from that of an ultra-scientific nature such as X-ray analysis down to the proper design of a draw buggy. Then, the organization would be really useful and not only commercial lime manufacturers would avail themselves of its store of knowledge, but also the chemical industries which are also large producers of lime, and other chemical industries that use lime. Thus the organization would grow into something really worth while. In Germany, carbide manufacturers are very active members of the lime association. Over here, carbide manufacturers hardly know that there is such a thing as the National Lime Association; and, one may ask, why should they?

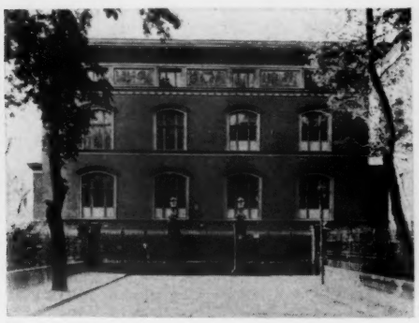


Fig. 34. Home of German Lime Manufacturers' Association

I have probably traveled as much and studied as many plants as anyone ever did, so I should have a perspective view of the situation. I can't quite see why the range of efficiency should be so great. I have encountered plants with a ratio of only two to one and know of others with ratios of seven to one, both in the year of 1930. The reason for this great range in good and bad is in the main ignorance, although I also realize that there may be at times economic conditions that cause revolt against scrapping obsolete equipment. Such conditions are, however, only periodic and usually other times follow that make the change possible. No matter however possible or impossible changing may be, the capable executive should always know what his plant ought to be like in the present light of knowledge. There may be some excuse for not having a fully modern plant; but there is no excuse for not having more than a mental picture of it.

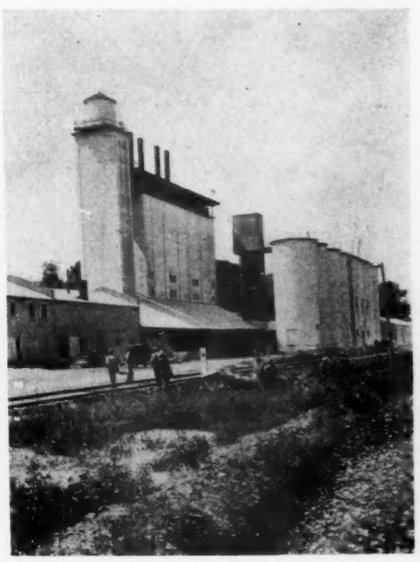


Fig. 33. Storage and packing department of a modern American plant

Fig. 36. Herr Seeger, chief engineer, German Lime Manufacturers' Association

Here we should recognize that a factor in the hesitancy of the lime manufacturer is that he is not sure that the improvement may be a truly profitable one. I am sure that many plant owners would start tomorrow to rebuild their plants if the prospects were not so speculative. But, they are fully justified in having fear. I dare say that mighty few new plants built have performed as well as they were expected to. Promises of this and that man with fingers in the pie did not come true. All this is due to the general haziness which pervades the entire subject of lime, for which the industry can blame only itself. The entire subject is without question highly technical and only men

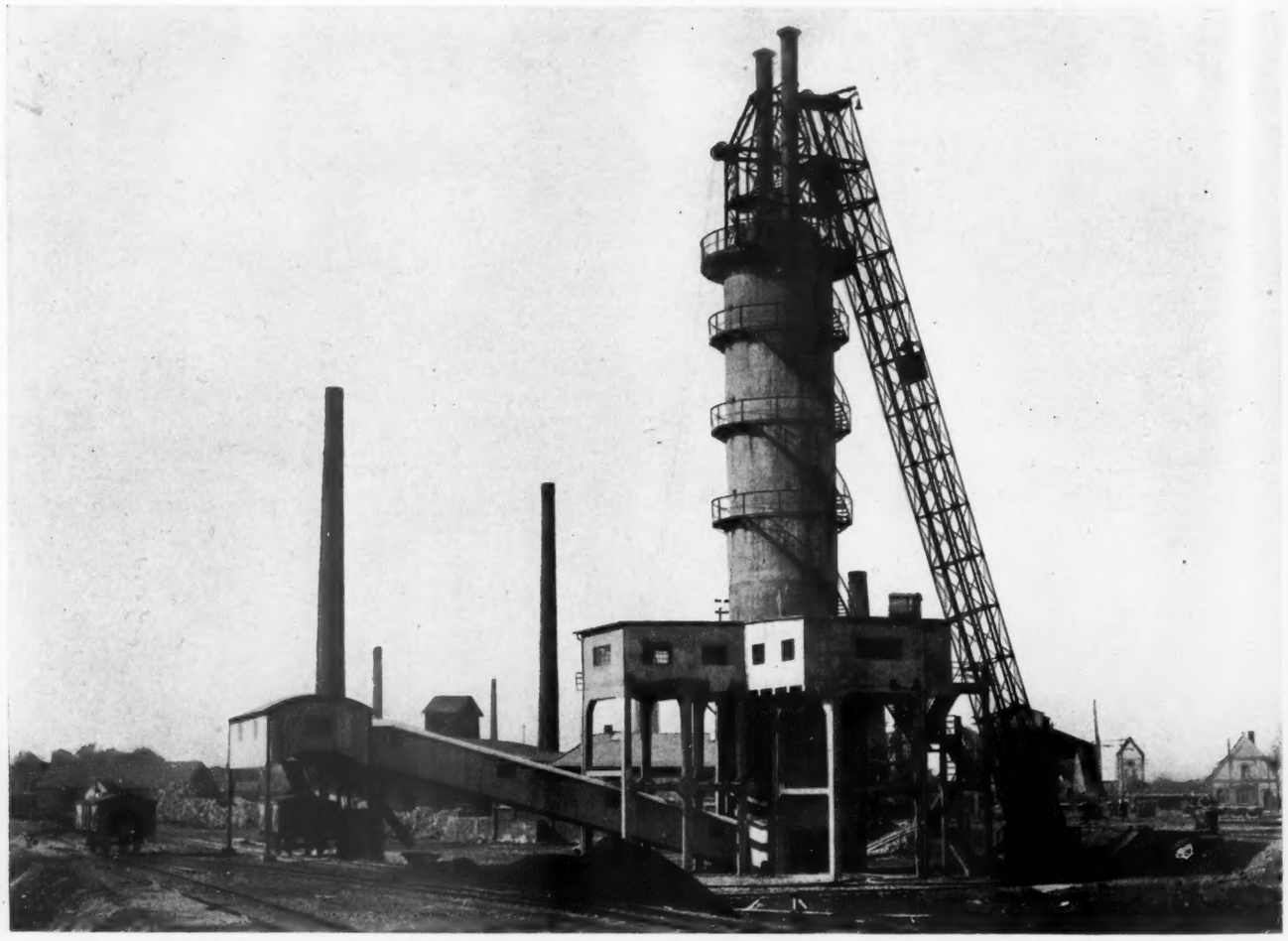


Fig. 37. German kiln 135 ft. high and producing 110 tons per day

of technical training and scientific inclinations can dissipate this haze and bring the whole into a rational state. Such men have never been fully appreciated by lime manufacturers, much less cultivated and attracted to the industry. Often they had to suffer sarcasm, and antipathy was quite evident.

However, many another industry has passed through the same stages of evolution, and lime manufacturers will, one of these days, wake up to their opportunities as the others have done.

(*To be continued*)

Bethlehem Mines Corp.'s Hanover Quarry Has Safety Record

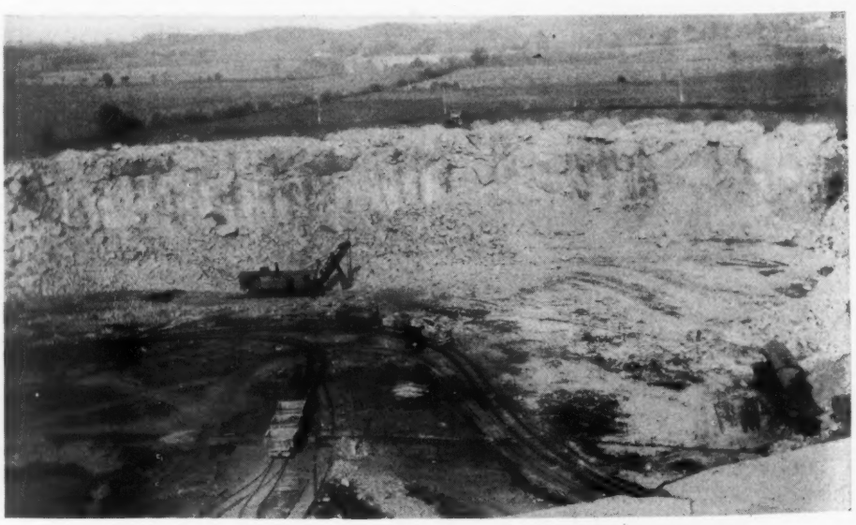
TWO YEARS without a single lost time accident is the exceptional safety record of the Hanover quarry of the Bethlehem Steel Corporation, at the end of the year 1930.

During the calendar years 1929 and 1930 the number of hours worked totaled 476,424. In view of the many hazards in this type of operation, the record of two complete consecutive years with no accidents whatever is regarded as exceptional in industrial centers.

In the two preceding years there were ten lost time accidents including one fatality, for a total of 624,421 hours worked.

"The record at Hanover indicates the value of intensive safety effort, even with small operations," said M. L. Jacobs, manager of quarries for Bethlehem. "The operation at Hanover is a limited one, with about 100 persons employed, but the accident situation always comes down to the personal equation and the care of one worker or one hundred workers is just as important as the care of ten thousand.

"Our accomplishment during the past two years may be credited to the excellent safety program handled by our employes who have their first aid teams, competitions and first aid work, and very thorough training in accident prevention activity."



This quarry has operated two years without a lost-time accident

Plant Design and Practices—Part I

Details Often Neglected

By G. W. Maisak
Crushing and Grinding Division of Consolidated Products Co., Inc.

THE GENERAL THEORY of plant design and layout of machinery has been discussed in other previous published articles and it is the author's intention to present some "rule-of-thumb" practices which will assist in the detailed design of a modern crushing plant. The author will start from the primary equipment and follow through the usual plant layout.

Feed Hopper

The first problem would naturally be the feed hopper of the primary crusher.

It might be well to state now that the author refers to any crusher larger than an 18-in. by 36-in. as a primary breaker. Some operators prefer using old rails for making a feed box similar to that shown in Fig. 1. It is noted that the rails are set at an angle of 35 deg. to 40 deg. In the smaller size crushers, it is more desirable to use the lower angle as more "barring-down" is generally necessary than in the larger sizes of crushers. Therefore, the stone must be retarded so that the opening is not bridged by a sudden surge. However, at no time should the angle exceed 40 deg. if damage to the crusher swing jaw is to be minimized. In reference to the size of the feed box, the volume should be about three times the capacity of the dump body. Fig. 1 shows the approximate proportions which are to be recommended. Listed below are several examples:

18-*in. by* 36-*in. jaw crusher, using* 3-*cu. yd. dump body*
$H = 3\frac{1}{2}\ A = 63$ in.
$W = 13$ ft.
Approximate cubic capacity = 9 cu. yd.

24-*in. by* 36-*in. jaw crusher, using* 4-*cu. yd. dump body*
$H = 2\frac{3}{4}\ A = 66$ in.
$W = 13$ ft.
Approximate cubic capacity = 13 cu. yd.

42-*in. by* 48-*in. jaw crusher, using* 5-*cu. yd. dump body*
$H = 1\frac{1}{2}\ A = 63$ in.
$W = 15$ ft.
Approximate cubic capacity = 15 cu. yd.

42-*in. by* 60-*in. jaw crusher, using* 6-*cu. yd. dump body*
$H = 1.7\ A = 72$ in.
$W = 16$ ft.
Approximate cubic capacity = 18 cu. yd.

The use of the depth factor will depend upon other special conditions to be met, as it is sometimes desirable to keep the feed box narrow, although a wider feed box with lesser depth saves wear and tear on the crusher swing jaw.

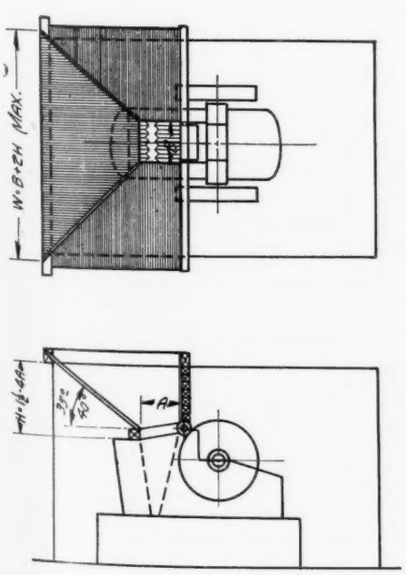


Fig. 1. Feed hopper using old rails set at an angle

A Better Feed Hopper

The above type of feed has the disadvantage of being affected by weather conditions and the variation of dirt coming with the stone from the quarry, as it affects the "slipperiness" of the rails. Another disadvantage is that large pieces of stone are just as liable as not to go into the crusher with the largest face foremost, thereby increasing the chances of bridging.

The author is more in favor of the "stone-on-stone" type of feed box as shown in Fig. 2. This type of box is generally more expensive than the one built of old rails, but once built needs no further attention. The author is aware that it is not in common use except in some of the larger plants of recent design, but recommends its more extensive use. The box can be built up of 6-in. by 6-in. timbers as shown in the drawing and lined with metal if desired. When the large sizes of primary crushers are used, it is preferable that it be made up of fabricated steel in order to stand the more severe service required of it. The box fills up with stone and forms its own chute at the natural angle of repose. The stone rolls into the crusher in a more natural manner and adapts itself to varying weather conditions. In addition, the larger pieces of stone are almost sure to slide in with the smallest face foremost, due to the retarding action of the stone built up in the box. In this type of box, the total volume should be approximately four times the capacity of the dump truck. The width of the box should be kept down as much as possible.

In the next article the problem of a "stone-on-stone" feed box used in conjunction with a gyratory crusher as a primary breaker will be discussed.

(*To be continued*)

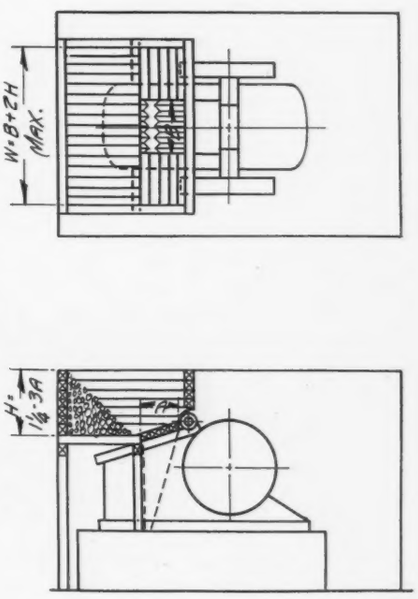


Fig. 2. "Stone-on-stone" type of feed hopper favored by the author

New Process Widens Possibilities of Low Grade Phosphate Rock

THE ALMOST UNLIMITED DEPOSITS of low grade phosphate rock in the southern states can be made more economically available for phosphate fertilizers through the use of blast furnace, according to Dr. Henry G. Knight, chief of the Bureau of Chemistry and Soils of the Department of Agriculture, Washington, D. C.

Dr. Knight said that the latest experiments by the bureau, which have demonstrated that phosphate rock and potassium bearing silicates can be smelted together and combined to form potassium phosphate, a highly concentrated fertilizer salt, give promise of another important fertilizer development in the South.

Researches on the Rotary Kiln in Cement Manufacture*

Part XIII—Calculation of the Theoretical Flame Temperature of the Rotary Kiln

By Geoffrey Martin

D.Sc. (London and Bristol), Ph.D., F.I.C., F.C.S., M. Inst. Chem. Eng., M. Inst. Struct. Eng., M. Soc. Pub. Analysts, F. Inst. Fuels; Chemical Engineer and Consultant; Former Director of Research of the British Portland Cement Research Association; Author of "Chemical Engineering"

TO START WITH we assume that 1 lb. of standard coal in burning liberates 12,600 B.t.u. and forms the following gaseous mixture:

CO_2	2.624 lb.
N_2	7.669 lb.
H_2O	0.448 lb.
Excess air	0.537 lb.
	11.278 lb.

The total air (including 5% excess air) required for the combustion is put as 10.478 lb.

We will start by assuming that the air for combustion is at 60 deg. F. Subsequent calculations will allow for the effect of preheating the air to various amounts. The method adopted is as follows:

We first calculate approximately the maximum temperature attained by the gas. We know that this is *about* 4000 deg. F. (2,204 deg. C.). Then the *mean specific heats* of the component gases of the combustion gas are taken between 60 deg. and 4000 deg. F. from the specific heat tables worked out by the writer from the most recent available data as follows:

Mean specific heat of CO_2 between 60 deg. and 4000 deg. F.	0.2771
Mean specific heat of N_2 between 60 deg. and 4000 deg. F.	0.2769
Mean specific heat of H_2O (vapor) between 60 deg. and 4000 deg. F.	0.6261
Mean specific heat of *air* between 60 deg. and 4000 deg. F.	0.2683

The water is supposed to be gasified at 60 deg. F. (15.6 deg. C.), and then, while in a state of vapor, it is heated to its maximum temperature T deg. F. By interpolation from A. W. Smith's results (Glazebrook's "Dictionary of Applied Physics," 1922, vol. i., p. 554) the latent heat of evaporation of 1 gram of water at 60 deg. F. (15.55 deg. C.) is 587.7 gram-calories, or 1 lb. of water at 60 deg. F. requires $587.7 \times 1.8 = 1057.9$ B.t.u. to turn it into vapor.

We next calculate the *approximate* flame temperature T deg. F. attainable by the furnace gases as follows:

Heat liberated by 1 lb. coal = heat absorbed in raising the products of combustion to T deg. F.; or,

$$12600 = \underset{CO_2}{2.624 \times 0.2771\ (T-60)} + \underset{N_2}{7.669 \times 0.2769\ (T-60)} + \underset{H_2O}{0.448 \times 1057.9} + \underset{H_2O}{0.448 \times 0.6261\ (T-60)} + \underset{Air}{0.537 \times 0.2683\ (T-60)},$$

whence

$$T \text{ deg.} = 3763 \text{ deg. F.}$$

The approximation made here is the assumption that the specific heats of the gases follow a straight line law between 60 deg. and 4000 deg. F., which is nearly, but not quite, true.

Also the mean specific heat of the furnace gases between 60 deg. and 4000 deg. F. is assumed as the same as that between 60 deg. and 3763 deg. F.

The errors thus introduced are slight, but perceptible corrections will be introduced below.

Effect of Preheated Air on the Flame Temperatures

The preceding flame temperature of 3763 deg. F. was calculated on the assumption that the entering air needed for the combustion of the coal was at the atmospheric temperature of 60 deg. F. and so did not carry in with it any heat.

If, however, the air was preheated to t deg. F. by the time it inflamed the coal dust, the quantity of heat carried by this air into the furnace is equal to the number of B.t.u.'s required to raise the 10.478 lb. of air necessary for burning 1 lb. of standard coal from 60 deg. to t deg. F.

Let the quantity of heat be denoted by Q_t B.t.u.'s, then Q_t must be *added on* to the 12,600 B.t.u. liberated by the coal in order to arrive at the total heat liberated in the furnace per 1 lb. of coal burnt. The presence of preheated air must, therefore, raise the flame temperature.

We must now calculate a series of *approximate flame temperatures* corresponding to air preheated by various amounts, which temperatures will later be used for deducing *more exact values* in the manner described below.

For our purpose it will be sufficiently correct to assume that the mean specific heats of the gases concerned are those prevailing between 60 deg. and 4000 deg. F. This will result in the flame temperatures being usually slightly too high, but the error so introduced will be nearly compensated for by opposite errors in deducing the more exact results detailed below.

The former formula for calculating the flame temperature now becomes modified as follows:

Total heat = heat liberated by 1 lb. of coal + heat brought into the furnace by 10.478 lb. of air = 12,600 B.t.u. + Q_t.

So that

$$12{,}600 + Q_t = 2.624 \times 0.2771\ (T-60) + 7.669 \times 0.2769\ (T-60) + 0.448 \times 1057.9 + 0.448 \times 0.6261(T-60) + 0.537 \times 0.2683\ (T-60)_t$$

whence $T = 3763 + 0.3053Q_t$ .....(1)

Q_t is calculated from the tables for the *rapid estimation of the heat carried away by the exit gases of cement rotary kilns* ("Progress Report of the British Portland Cement Research Association for April, 1924"). The results are shown in Table I.

TABLE I—QUANTITY OF HEAT REQUIRED FOR PREHEATING 10.478 LB. OF AIR FROM 60 DEG. F. (15.6 deg. C.) VARIOUS TEMPERATURES

Temperature in deg. to which the air is to be preheated t deg.		B.t.u.'s required to heat 1 lb. of air from 60 deg. to t deg. F.	B.t.u.'s required to heat 10.478 lb. of air from 60 deg. to t deg. F. Qt
deg. F.	deg. C.		
60	16	0.000	0.0
100	38	9.212	96.5
200	93	32.242	338.0
300	149	55.560	582.0
400	204	79.004	828.0
500	260	102.710	1076.0
600	315	120.609	1327.0
700	371	150.718	1579.0
800	427	175.002	1834.0
900	483	199.472	2090.0
1000	548	224.187	2349.0
1100	594	249.017	2609.0
1200	649	274.163	2873.0
1300	704	299.375	3137.0
1400	760	324.867	3404.0
1500	815	350.558	3673.0
1600	871	376.446	3944.0
1700	926	402.532	4218.0
1800	982	429.177	4497.0
1900	1038	455.360	4771.0
2000	1093	481.990	5050.0
2100	1149	508.937	5333.0
2200	1204	535.940	5616.0
2300	1260	563.090	5900.0
2400	1315	590.453	6187.0
2500	1371	618.363	6479.0

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Now, substituting the various values of Q_t from Table I in formula (1) we obtain the following approximate *flame temperatures* corresponding to the different temperatures to which the air is preheated:

TABLE II—APPROXIMATE THEORETICAL FLAME TEMPERATURE OBTAINABLE BY THE COMBUSTION GASES IN A ROTARY CEMENT KILN—

$$T = 3763 + 0.3053\ Q_t$$

Temperature to which entering air is preheated	Approximate flame temperature	Temperature to which entering air is preheated	Approximate flame temperature
Deg. F.	*T* deg. F.	Deg. F.	*T* deg. F.
60	3763	900	4401
100	3792	1000	4480
200	3865	1100	4559
300	3941	1200	4640
400	4016	1300	4721
500	4092	1400	4802
600	4168	1500	4884
700	4245	1600	4967
800	4323		

More Accurate Calculation of Flame Temperatures

The preceding results are only approximate for reasons above mentioned, but they can be made the basis for more accurate determinations of the flame temperatures as follows:

The furnace gases when heated from 60 deg. F. to *T* deg. (highest flame temperature degree) will absorb 12,600 B.t.u. But from the *Table* worked out by the author for the British Portland Cement Research Association we can find out very accurately the quantity absorbed in heating the furnace gases from 60 deg. to 1481 deg. F., and the difference between this quantity and 12,600 B.t.u. will be the amount of heat absorbed in heating the gases from 1481 deg. F. to the final temperature *T* deg.

We will calculate these quantities:

QUANTITY OF HEAT LIBERATED BY 11.278 LB. OF FURNACE GAS SINKING FROM 1481 DEG. TO 60 DEG. F.

Gas	B.t.u.'s evolved by 1 lb. in sinking from 1481 deg. to 60 deg. F. (*a*)	Weight of gas (*b*) lb.	Total B.t.u.'s ($a \times b$)
CO_2	360.911 — 5.831 = 355.080	2.624	931.7299
N_2	362.685 — 6.633 = 356.052	7.669	2730.5628
H_2O (vapor)	696.358 — 13.107 = 683.251	0.448	306.0964
Excess air	352.200 — 6.448 = 345.752	0.537	185.6688
		11.278	4154.0579

So that 11.278 lb. of furnace gas sinking from 1481 deg. F. to 60 deg. F. liberate 4154.1 B.t.u. To this must be added the quantity of heat liberated when 0.448 lb. of *water vapor* at 60 deg. F. condenses to *liquid water* at 60 deg. F.

This equals 0.448 × latent heat of evaporation of water at 60 deg. F.

$$= 0.448 \times 1057.9$$
$$= 473.9 \text{ B.t.u.}$$

Hence the total amount of heat liberated by 11.278 lb. of furnace gas sinking from 1481 to 60 deg. F. is 4154.1 + 473.9 = 4628 B.t.u. This is, of course, the same as the quantity of heat absorbed in heating the same weight of gas from 60 deg. to 1481 deg. F.

Now from Table II, given in Part XII of this series, the mean *specific heat* of the furnace gases between 1481 deg. and 3735 deg. F. is 0.3089.

Hence we have the following more exact formula for calculating the theoretical attainable temperature by the combustion gases.

Let *T* deg. F. be maximum flame temperature. Consider the 11.278 lb. of gas to be raised first from 60 to 1481 deg. F. and then from 1481 deg to *T* deg. F.

Then, as before:

$$\textit{Total heat} = \left\{\begin{array}{c}\text{Heat absorbed in heating}\\ \text{combustion gas from}\\ \text{60 deg. to 1481 deg. F.}\end{array}\right\} + \left\{\begin{array}{c}\text{Heat absorbed in heating}\\ \text{combustion gas from}\\ \text{1481 deg. to } T \text{ deg. F.}\end{array}\right\}$$

$$12600 = Q_t + 4628 + 11.278\ (T - 1481) \times S_T$$

or

$$T = \frac{7972 + Q_t}{11.278 \times S_T} + 1481 \quad \ldots\ldots\ldots\ldots \quad (2)$$

Here T = flame temperature in deg. F.

Q_t = B.t.u.'s brought into furnace by 10.478 lb.

S_T = *mean specific heat* of the combustion gas between 1481 deg. and T deg. F.

Now, inserting in (2) the various values of Q_t, taken from Table I and the varied values for S_T corresponding to the approximate flame temperatures given in Table I for various degrees of preheating the air, we then arrive at the following table (III) of more exact flame temperatures. In the latter part of the table the values used for S_T are those appertaining to the calculated flame temperature just below the one required to which the temperature difference between the last pair of flame temperatures has been added. This procedure makes the results slightly more accurate in the latter part of the table than in the former, but the errors are quite negligible for practical purposes. The actual values for S_T are taken from Table II, Part XII. Of course the higher values of the calculated flame temperature could not be obtained in practice on account of the thermal dissociation of the various gases.

The next part of this series will discuss the weight of clinker producible, using combustion gases of different flame temperatures and supplying 10.478 lb. of air per 1 lb. of standard coal burned.

TABLE III—MORE ACCURATE CALCULATIONS OF THE THEORETICAL FLAME TEMPERATURES OBTAINABLE BY THE COMBUSTION GASES IN A ROTARY CEMENT KILN

$$T = \frac{7972 + Q_t}{11.278 \times S_T} + 1481$$

Temperature to which entering air is preheated		Calculated flame temperature	
Deg. F.	Deg. C.	Deg. F.	Deg. C.
60	16	3769	2076
100	38	3794	2090
200	93	3855	2124
300	149	3916	2158
400	204	3977	2192
500	260	4038	2226
600	315	4100	2260
700	371	4160	2293
800	427	4222	2328
900	483	4282	2361
1000	548	4344	2396
1100	594	4405	2430
1200	649	4465	2463
1300	704	4525	2496
1400	760	4586	2530
1500	815	4645	2563
1600	871	4706	2597
1700	926	4805	2652
1800	982	4862	2683
1900	1038	4936	2725
2000	1093	4995	2757
2100	1149	5071	2800
2200	1204	5147	2842
2300	1260	5224	2885
2400	1315	5301	2927
2500	1371	5370	2966

(To be continued)

Beg Your Pardon!

A NEWS ITEM, based on local newspaper reports, in ROCK PRODUCTS, January 31, p. 54, stated that the McGrath Sand and Gravel Co., Lincoln, Ill., was expanding its operations and would build a new plant at Mackinaw, Ill. T. E. McGrath writes under date of February 17:

"There is no foundation for an item of this kind getting into print, and it is quite misleading to the industry. It also places us in the wrong light with the other operators, as we have been one of the leaders in discouraging the expansion of old plants and the building of new ones on account of the serious over-production that now exists here in Illinois.

"While it is true that we have rebuilt our plants from time to time, as they became obsolete, still the capacity of our plants has not been increased since 1925, which was about the time that production in Illinois started to go beyond the demand. At Mackinaw we have merely purchased a few additional acres of land adjacent to our present operations. We have no intention of increasing our capacity nor our investment at the Mackinaw plant."

Five Years' Building Outlook

THE STANDARD STATISTICS CO., INC., New York City, has made a very thorough and exhaustive study of the outlook for construction during the next five years, based on available statistics of every character, primarily for the purpose of rating the investment possibilities of building material manufacturing corporations. The general conclusions regarding construction are given as follows:

General Conclusions

"(1) The volume of new construction over a period of years is determined primarily by demand and supply.

"(a) These rather cumbersome economic forces normally assert themselves more slowly than is the case with wants and needs involving only small financial outlays, and, as a consequence, the high and low points in a curve picturing trends are quite pronounced. In other words, the pinch of demand and the ease of a situation marked by adequate supply provide sharp contrasts.

"(2) A surplus of housing facilities has existed for several years, owing to the record breaking levels of building construction prior to 1929, and this excess of supply resulted in the residential division's slump which began in 1928. Commercial and industrial space also now are excessive.

"(3) Demand is determined, in the long run, by the curtailing effect of purchasing power upon the people's wants. The current shrinkage of ability to buy cuts down demand and tends to increase the percentage of vacancy.

"(4) The credit costs common to the building industry are the carrying and service charges on real estate mortgages. This is a more or less independent system of rates for the use of money. The service charges advance in eras of high commercial rates, but do not vary much from a standardized normal at other times. Under the present conditions of cheap money for general uses, costs of construction credit are two to three times the commercial rate, which means that the interest factor in itself cannot be counted upon to stimulate building.

"(5) The speculative builder is not now a factor in promoting construction because recent over-extension in this field and the excess of housing supply over demand have caused his mortgage paper to become 'frozen.' Moreover, there is a trend toward greater conservation on the part of lenders of funds for building purposes. As regards new ventures, the speculator is unwilling to assume the risk of being forced to carry the high interest charges on space which likely would remain vacant for some time.

"(6) Building costs, which now are more favorable than at any time within the past 2½ years, are unlikely to register a further substantial decline in the near or medium term.

"(7) The initial cost of modern houses is out of reach of about 60% of this country's population. Whenever the current agitation for mass production of houses and greatly diminished prices becomes fruitful, so that many renters can afford better quarters, the resultant demand for new construction will be substantial.

"(8) Replacement requirements in the building industry, because of fire and obsolescence, normally reach a value of about $150,000,000,000 per annum, and a few years of delay in construction, corresponding with conditions, would provide an immense backlog of future business.

"(9) The current cycle of the building curve gives evidence of having about reached bottom, but the movement is likely for some time to be sidewise, with results not substantially exceeding the corresponding months this year before the middle of 1931.

"(10) After 1931, and possibly before expiration of the year, the curve representing total building and engineering construction should register a sharp uptrend. The prospects are that operations will reach new peak levels before the close of 1934, thus restoring to the industry a high degree of prosperity.

A Stock Price Forecast

"For the near term, therefore, the outlook is not impressive. Being included in an oversupplied key industry which cannot be expected to turn upwards as soon as some lines having smaller and faster moving inventories, and still lacking the guidance which will be furnished for the uptrend by industry in general at a proper time, building securities are likely to drag along bottom pending the prevalence of better news.

"These conditions preclude trading commitments in the construction field. They indicate that haste is unnecessary in assuming market positions here, and that funds for the time being can be used to better advantage elsewhere.

"Considered from a long pull point of view, however, the building stocks offer, we believe, worthwhile possibilities. As a group, they are unlikely to go much lower even though sizable improvement should be delayed until well into next year. In the meantime, several individual issues are paying attractive dividends which are adequately covered by earnings.

"Judged in the light of prospects that within the next two to four years the industry will have attained at least normal levels—meaning more than doubling of residential construction activities and an increase of some 33% or more in the commercial and industrial divisions—it is evident that good profits await those who purchase the best stocks at or near their recent low prices to hold until the anticipated recovery has been fully realized. Patience must be exercised, and ability to maintain a position once taken must be a prime consideration, after which precautions the way becomes infinitely easier."

Public Building Program Expands in Entire Nation

THE WAY has been cleared for the starting of more than $800,000,000 of public and semi-public construction work within the next few months, the President's Emergency Committee for Employment announced recently on the basis of reports of specific projects compiled by its public works section.

This work has already been authorized and acted upon, Col. Arthur Woods, chairman of the committee, has explained, and comprises various projects throughout the country which have advanced beyond preliminary stages. He has declared the committee is in touch with every individual project and has found that "in a surprising number of cases" obstacles have been removed to speed up these jobs and provide employment.

The committee's announcement concerning the inauguration of public works projects follows in full text:

More than $800,000,000 in public and semi-public works construction are in such shape that they can be started within the next few months. The estimate is based on reports received from Franklin T. Miller, who heads the committee's public works section.

"All of this work," Mr. Miller said, "has advanced beyond the stage of procuring funds, authorization of selection of sites, litigation and the other preliminary steps which frequently delay public construction programs. Our estimate is based on personal letters and information on specific projects of a public or semi-public nature, including state, municipal and county buildings, schools and highways, amounting to more than $2,000,000,000. It is based on a tabulation of actual jobs which have come before us, one at a time, during the last three or four weeks.

Reports Most Favorable

"It has been said that the total normal annual construction in this country amounts to some $10,000,000,000," Mr. Miller continued. "Of this, 35 to 40% is for public works and 5% for federal works. Up to the time of this announcement we have received reports on $1,853,733,000 of public construction, so our reports are coming in at the rate of approximately $80,000,000 a day. Hence we have a pretty accurate idea today of the status of more than 40% of the public and semi-public construction for next year.

"This indicates that a very substantial

amount of work which is not at all dependent upon commercial returns from rentals, manufacturing, and so forth, will be under way shortly, provided only that plans can be completed and contracts let. We are hopeful that bills now before congress will expedite the work now being done in the office of the supervising architect of the treasury and permit the speeding up of plans and specifications."

The report of the public works section is based on replies received to letters sent out to architects, contractors and those in charge of public and semi-public works in all sections of the country, Mr. Miller stated.

"We have been making every effort to remove the obstacles which stand in the way of individual building projects," he said.

Illustrative of the types of work which are being accelerated to provide employment are such projects as a $575,000 University of Detroit high school, a $600,000 memorial hospital in Pawtucket, R. I., a $450,000 high school in Chillicothe, Ohio, a $2,500,000 municipal airport in Akron, Ohio, a $400,000 addition to the senior high school in New Rochelle, N. Y., and a $9,500,000 sanitary district project in Mahoning Valley at Mineral Ridge, Ohio.

Much evidence of an unusually cooperative spirit is accumulating daily from all those concerned with public construction programs, according to Mr. Miller. "We have had more returns than we anticipated," he said. "We have had an extraordinarily favorable response. We find much more construction actually getting under way than we had thought possible."

United States Gypsum Co. to Give Up Farm Side Line

THE United States Gypsum Co., Chicago, Ill., has made a huge success by adding side lines to its original gypsum plaster product—including paper, metal lath, lime, etc.—but evidently farm products are not in this class, for the *Buffalo* (N. Y.) *Courier-Express* has announced that:

"The United States Gypsum Co., operator of the world's largest gypsum mill at Oakfield, is going out of the farming business after several years of direct operation of a large number of farms in the Oakfield territory. The farms were secured to hold the mining rights and were operated by the company in general charge of Jack Pope, farms manager.

"Harold Keyes, Palmer Brightsman and Philip I. Higley, Oakfield, and Arthur Martin Batavia, who have managed farms for the company, have been released, effective April 1, and the properties will be offered for cash rental or share leasing, the company retaining titles to hold the mining privileges. It is also understood that a retail milk business will be offered for sale or rent in Oakfield."

Forecast of the Year in the Building Industry

A FORECAST of building conditions for 1931 was recently made by C. Stanley Taylor, director of research for the *Architectural Forum*, following the custom of that publication for the last 10 years. This forecast has been developed from an analysis of the trends which govern in the building industry, as well as from a survey of work already contemplated for the year, and from questionnaires sent out to architects and others.

Taking all these into consideration, Mr. Taylor points out that for the year 1931 there are several unusual factors which are highly encouraging for the building industry and consequently for the allied interests and the country as a whole. These include the following:

1. All indications point to a building program arising through normal channels at least equal in volume to that of 1930.
2. Greatly decreased building costs.
3. Added to the above volume there is to be an important new source of work for the building industry. This is the publicly financed building program sponsored deliberately by the federal government and by various states, counties and municipalities to meet the present economical needs of the country.
4. The survey of mortgage conditions indicates steady improvement which will tend to encourage building activity.
5. There is a growing demand for better construction and toward the elimination of "jerry building." This movement is being sponsored seriously by the controlling financial interests.
6. There is a growing demand for new structures in the institutional and residential fields.

The class of construction which will show the greatest increase in 1931 over 1930 will be in the line of public buildings, this increase being expected to be over 200%. This of course will be due to publicly financed building programs which will be carried out to meet the unemployment situation. Theaters will probably show an increase of about 150%. This is credited to the contemplated construction of several chain projects. It is expected that community and memorial structures will show an increase of about 100%. Welfare buildings, Y. M. C. A.'s, etc., will show an increase of about 45%.

In industrial buildings it is estimated at about 40%, although it is conceded that this forecast figure may be somewhat high because of difficulty in financing some of the contemplated projects. This same difficulty applies to hotels, which it is predicted may show an increase of about 30% over 1930, which was an unusually small year in this line of construction.

Club and fraternal buildings will increase about 40%, churches 37%, dwellings below $20,000 in cost an increase of 15%, hospitals 10%, schools 5%. Dwellings above $20,000 up to $50,000 are expected to show a slight increase, while dwellings above $50,000 will remain practically as in 1930. Apartment hotels and automotive buildings will show slight increases, while bank buildings will remain about the same as last year.

It is expected that apartment buildings will show a decrease of about 18%; stores, including warehouses, a decrease of 55%, and transportation buildings a decrease of about 30%.

Louisiana's Only Quarry Rapidly Expanding

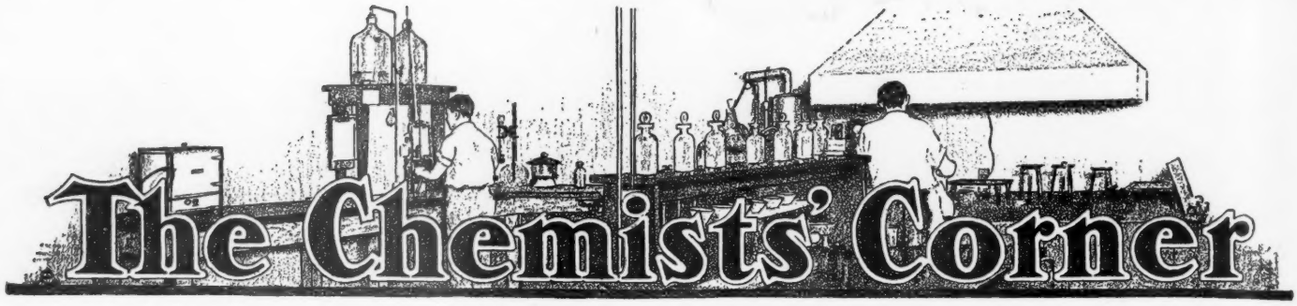
A GIGANTIC DEVELOPMENT is now going on at the limestone quarry five miles west of Winnfield, La., including the permanent salt mine proposition being rushed to completion by the Louisiana Development Co. The construction of 2½ miles of railroad is now under way by the Louisiana and Arkansas Railway Co. from a point 3 miles west of Winnfield on the main line to the rock quarry, where the Louisiana Quarry Co., successor to Southern Mineral Co., is now operating day and night turning out approximately 2000 tons of crushed stone for the Louisiana Highway Commission each 24 hours. The salt mine, when in operation some time next summer, will produce around 1000 tons daily. The new electrified stone crusher plant, construction on which is to begin at an early date, when completed will increase the output of crushed stone by the Louisiana Quarry Co. to more than 500 tons per day.

The Louisiana Quarry Co. recently leased the limestone quarries of the Southern Mineral Co. The new company is composed of Oklahoma, Missouri and Arkansas people, and has an authorized capital of $300,000, with $50,000 paid in.

The new company is financed by Oklahoma, Missouri and Arkansas business men, the personnel being composed of Rutherford Snow Wilson, Little Rock, Ark., president; Chauncey D. Nichols, Oklahoma City, vice-president, and Asa Clair Butterworth, secretary-treasurer.

The new operators will operate the old steam plant of the Southern Mineral Co. until they can install new crushing plant and quarry equipment. The new equipment will all be electrically powered, will cost about $500,000 and will increase production from 800 tons to over 5000 tons daily. The entire output of the Louisiana Quarry Co. has been contracted for by Gov. Huey P. Long for use in his concrete and asphalt paving program.

The Southern Mineral Co. operated its own railroad from the quarry into Winnfield in the past. This road will be abandoned, as the Louisiana and Arkansas Railway Co. is now building a road direct from its main line two miles west of Winnfield to the quarry—*Alexandria* (La.) *Town Talk.*



The Upper SO_3 Limit in Portland Cement

By F. O. Anderegg

Formerly Senior Industrial Fellow, Atlas Portland Cement Co.'s Industrial Fellowship, Mellon Institute of Industrial Research, Pittsburgh, Penn.

THE NECESSITY of better retardation of the initial set of the finely ground, high-early-strength cement is the logical reason for the addition of more gypsum to portland cement clinker than has been permitted in the past. Another angle, which may well be considered, is the possibility of forestalling part, at least, of the harmful action of sulfates on the aluminates in portland cement. When sulfates react with the calcium aluminate the volume of the aluminate increases about 200%, and if this reaction takes place completely before the cement sets, a potential cause of disintegration would be eliminated.

The question then rises as to the safe upper limit of the SO_3, since it is well known that excess gypsum reduces the durability of portland cement[1], probably by crystal growth[2]. Some preliminary results have already been published[2] and those experiments have been extended to two other cements and to longer storage periods.

The cement used was flour separated by elutriation with carefully dried air and at such a rate that practically all particles were below 10 microns in diameter, and the bulk of the hydration reaction, especially that of the aluminates, would be complete within a short time. The oversize from cement *C* was reground and separated then to give a fraction containing less SO_3, called cement *D*.

The cement was mixed 1:3 by weight with ideally graded sand[3] in which grading the ratio of the sand fraction retained on successive sieves, decreasing in mesh dimension by the factor 2, is close to 1.25; and 1-in. cubes were molded mechanically[4]. Each result is the average obtained from two specimens, almost all of which agreed very closely.

PLASTER OF PARIS ADDED TO CEMENT FLOUR—COMPRESSIVE STRENGTHS, LB. PER SQ. IN.—MIX 1:3 GRADED SAND NORMAL CONSISTENCY

Mole ratio SO_3:Al_2O_3	H_2O %	1 day damp	3 days wet	7 days wet	28 days wet	1 month wet 2 months dry	3 mos. wet	6 mos. wet
				Cement A				
0.60	15.0	3380	3920	4533	5890	8050	6060	8580
1.38	17.3	2854	3553	4000	5908	8673	6440	8815
1.97	18.8	2158	1523	2500	3680	6508	4243	9010
				Cement B				
1.69	15.3	5910	6735	7825	8875	8135	7223	7210
2.08	16.3	4800	4773	5000	5478		8883*	9140
				Cement C				
1.11	16.2a	3943	3558R	4675	5538		6145	6580
1.11	15.3	4763	4418R	6300	7645		4533XR	8535
1.51	17.3	4575	5703	6370	7445	8165	5578	8575
1.70	17.7	3750	2625R	4493	6783	8255	6308	8535
				Cement D (C reground)				
0.70	16.8	4963	6400	6893	8053	.....	8883*	9140
1.14	18.0	3705	3293	5193	9458	9170	8395*	8545

* = stored 2 months wet and 1 month dry.
X = crystals detected.
a = standard Ottawa sand, instead of the graded sand.
R = retrogression in strength.

Analyses of Cement

The analyses of the cements, as separated, are shown in the table below.

Chemical Reactions

According to Lerch, Ashton and Bogue[5] two complex calcium sulfoaluminates may be formed, $3CaO \cdot Al_2O_3 \cdot 3lH_2O$ being the relatively stable form, although decomposed by solutions of magnesium salts and of carbonates. The other compound of the formula $3CaO \cdot Al_2O_3 \cdot CaSO_4 \cdot 12H_2O$ was stated to be relatively unstable except in high concentration of hydroxyl ion. According to P. Menge[6], the form stable at the lower hydroxyl ion concentration is $3CaO \cdot Al_2O_3 \cdot 3CaSO_4$, but in the presence of more $Ca(OH)_2$ this is changed to $3CaO \cdot Al_2O_3 \cdot 2CaSO_4$. The former may not remove all the SO_3 from solution but the latter does.

When portland cement is gaged with water, the solution contains sufficient hydroxyl ion so that the low sulfate form may be present at first. It probably changes over fairly soon to the more stable form, which may grow into crystals large enough to be detected readily under the microscope. Such crystals have been identified by D. S. Hubbell in concrete serving as paving base and in other similar positions where it has been protected from the disintegrating action of magnesium salts and carbonates.

If one mole of tricalcium aluminate combines with three of calcium sulfate, the figures given in the table indicate that none of the cements contained any excess of calsium sulfate over that brought into combination with the aluminate, the highest ratio being about 1:2. To secure this ratio about 15% plaster of paris was required, so that

ANALYSES OF CEMENTS USED IN EXPERIMENT

	A		*B*		*C*		*D*	
	%	Millimoles	%	Millimoles	%	Millimoles	%	Millimoles
SiO_2	18.52		18.36		19.20		19.76	
Al_2O_3	7.08	69.2	4.88	47.7	5.76	56.3	5.76	56.3
Fe_2O_3	2.72		3.36		4.00		4.16	
CaO	60.60		62.20		62.50			
SO_3	3.38	41.2	6.45	80.6	4.98	62.3	3.14	39.2
SO_3:Al_2O_3 mole ratio		0.60		1.69		1.11		0.70

it is obvious that it would be impracticable to add enough calcium sulfate to change all the aluminate to the high sulfate form, even if its addition were otherwise unobjectionable.

However, the addition of plaster of paris has raised the water requirement and has had a detrimental effect on compressive strength, especially at the shorter ages. Also the retrograding tendencies noted here and previously indicate that the addition of SO_3 should be made cautiously and that the presence of the sulfo-aluminates does not appear to be helpful to concrete.

The reactivity of the tricalcium aluminate in a finely ground portland cement is such that sufficient sulfate needs to be present to prevent flash setting. If the alumina content is 5% and if the clinker is ground so fine that all the aluminate would hydrate within a short period after mixing with water, the upper limit for SO_3 would probably be 4%, a mole ratio of 1:1. The present proposal (A.S.T.M. designation: C 74-3OT) to raise the SO_3 limit for early strength cements to 2.5% would seem then to be conservative, especially in view of the fact that part of the SO_3 may be bound up in the clinker in an unreactive form.

One set of specimens was made up with standard Ottawa in comparison with the graded sand. The latter gave appreciably high results, with a single exception, where a mass of crystals was found in the two specimens broken after 3 months of storage in water. The presence of the crystals is sufficient to explain this retrogression in strength.

The hypothesis set up by Giertz-Hedström and Werner that the compressive strength is proportional to the square of the amount of cement hydrated has been apparently substantiated elsewhere.[7,9] But it is somewhat difficult to reconcile with the results reported here, using cement flour, in which the reaction is probably more than 80% complete within the first 24 hours.

Now it is known that silica gels on standing probably undergo certain indurating reactions, slowly but surely. The presence of moisture is doubtless an aid and the result is a constant change over to a hard, horny mass, perhaps similar in character to that found in flints and cherts. Such reactions would explain the increases in strength observed here. It may be that a coincidence occurred in the examples noted and the induration happened to advance at such a rate under the given conditions of storage, that the above hypothesis was apparently fulfilled.

The effect of combined storage was of interest, the compressive strengths being appreciably greater than when stored in water only.

Thanks are due to George Walther for careful preparation of test specimens and to D. C. Hubbell for petrographic examination of the specimens for crystalline growths.

Summary

Working with cement flour, to part of which plaster of paris had been added, compressive strengths obtained after different periods of storage indicate that the presence of 2.5% SO_3 is allowable, but that amounts much greater than 2.5% are undesirable.

The corollary to this conclusion is that the alumina content of the clinker should be kept within reasonable limits.

The rate of hardening of the specimens made from cement flour, the bulk of which is hydrated very soon, suggests that the indurating reactions of the silica gel play an important role in the hardening of the cement.

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British Standardization of Sieves for Industrial Use

AS A RESULT of a fully representative conference held in 1927, a technical committee was appointed by the Council of the British Engineering Standards Association to deal with the general standardization of sieves and screens.

The question of testing sieves was first dealt with and a draft British Standard Specification has now been tentatively completed and circulated to the trade and to interested organizations for criticism. The committee has now turned its attention to the preparation of a series of British standard woven wire and round hole perforated plate sieves for industrial purposes with the object of assisting both manufacturer and consumer by standardizing the more generally used sizes of woven wire cloth and perforated plate.

A preliminary schedule with three tables—No. 1 on clear mesh, No. 2 on woven wire cloth, and No. 3 on round hole perforated plate sieves—has been prepared and circulated to all those interested. The recipients have been asked to mark in the columns provided in the tables for the purpose, opposite the sizes which are purchased regularly in substantial quantities—(a) the most convenient width or widths of woven wire cloth and perforated plate for their purpose; (b) the material used for wire cloth and perforated plate in their industry; (c) whether, in the case of woven wire, they find it necessary to have a selvedge on each side of the cloth.

With the help of these questionnaires the committee will prepare a schedule of standard woven wire and round hole perforated plate sieves for general industrial purposes.

Graham Brothers, Long Beach, Calif., Expand

GRAHAM BROTHERS, Inc., and the George M. La Shell Corp., both of Long Beach, Calif., have been consolidated and effective February 1 are to be operated as Graham Brothers, Inc. The two concerns employ about 500 persons.

Graham Brothers, Inc., are producers of rock, sand and gravel. The crushed stone is barged from their Catalina Island quarries and trucked to Long Beach from Harbor City. The La Shell Corp., originated by the late George M. La Shell, is a building materials concern, widely known for its unusual business methods and policies towards its employes.

General offices of Graham Brothers, Inc., will be continued at 1512 West Seventh street, Long Beach, while the building material department of the merged concern will be operated from the La Shell plant at 645 West Anaheim street, with Walter C. Kempton, district sales manager, in charge.

The officials of Graham Brothers, Inc., will continue the same with Paul C. Graham, president and general manager.

A. L. Ferver, general manager of the George M. La Shell Corp. since its organization April 15, 1928, to take over the late George M. La Shell's business, has disposed of his interests in the corporation and will retire from the business. The personnel, other than Mr. Ferver, will remain the same at the La Shell plant.

Graham Brothers have been operating since 1909 when the two brothers, Paul and Robert Graham started in business with a span of horses and an old wagon.

New Manager for Wausau Quartzite Plant

A. P. TABOR of Minneapolis, Minn., recently became manager of the plant of the former Wausau Abrasives Co., Wausau, Wis., which is now owned by the Minnesota Mining and Milling Co. The company is now crushing and grinding silica rock from Rib Mountain, to be sold for use in making sandpaper and for many other uses. About 20 men are now employed at the plant.—*Antigo* (Wis.) *Journal.*

Cement Company Helps Finance County

THE CONCERN of county and school officers of Franklin county, Tennessee, owing to probable lack of funds, due to act of the legislature in extending payment of taxes from March 1 to June 1, has been greatly relieved by payments being made now by all the banks of the county and $13,264.16 by the Cumberland Portland Cement Co. of Cowan, it being the largest taxpayer in the county next to the railroad.—*Nashville* (Tenn.) *Tennessean.*

Recent Bids Received and Contract Prices

SOME RECENT bids received or contracts awarded in various parts of the country give the following unit prices:

Tell City, Ind.—Two bids were filed recently for the county gravel supply. One was filed by the Tell City Sand and Gravel Co. and the other by E. T. Slider. Both bids were at the same figure, $1.24 per cu. yd.

Highway Superintendent Gengelbach considered these bids out of line and undertook to convince the commissioners it will be more economical to obtain a crusher, open quarries in various parts of the county and resurface the roads with small sized crushed limestone in the place of gravel. Mr. Gengelbach was of the opinion he can get this stone and put in on the road at less than $1.50 cut per cu. yd. He also said the $10,000 the county would pay for gravel will be distributed among laborers and that all the money will remain in the county.

A suggestion was offered to the effect that the county again advertise for bids. But Mr. Gengelbach was so thoroughly convinced he could handle the problem in an economical manner he preferred to let matters stand as they were.

In the spring of 1923 the county bought 2500 cu. yd. of gravel for $1800. In years following that the prices were as follows: 1924, $1 per cu. yd.; 1925, 84 c. per cu. yd.; 1926, 84 c. per cu. yd.; 1927, 7000 cu. yd. for $5000; 1928, 80 c. per ton at Tell City and $1 per cu. yd. delivered at landings; 1929, $1.08 per cu. yd., and 1930, $1.20 at landings and $1.25 loaded at Tell City.

After giving the matter due consideration the board decided to follow the advice of Highway Superintendent Gengelbach and the bids were rejected.—*Tell City* (Ind.) *News.*

Red Wing, Minn.—The city must pay at least 31 c. a barrel more for cement which it will use this year than it did last, it became known when bids were opened at regular meeting of the board of public works recently. The lowest bid, submitted by the Central Lumber Co., was for $2.15 per bbl. net. Two other companies, the Red Wing Lumber Co. and the McCoy Lumber Co., bid $2.16 net. Last year the city paid $1.84 net.

"We got in on a real low market last year," said City Engineer Fred Enz recently, "and did not have any hope of geting such a price this year." The city called for bids on 2500 bbl. or less. No action was taken on the bids.—*Red Wing* (Minn.) *Eagle.*

Milwaukee, Wis.—The city this year will pay 6 c. per bbl. less for cement than last year. The executive committee of the purchasing board reported the Building Materials, Inc., offered the low bid of $2.03 per bbl. for 20,000 bbl. of cement.

Mansfield, Ohio—The Builders Supply Co. will furnish 500 tons, more or less, of stone at a price of $1.40 a ton, and the same quantity of sand at $1.25 a ton. This material will be used for the repair of various streets.

The D. and H. Coal Co. will supply the city with three carloads or more of cement for $1.80 per bbl.—*Mansfield* (Ohio) *News.*

Canton, Ohio—Contract was let by the city board of control recently to the Reliable Sand and Gravel Co. for 25,000 cu. yd. of gravel at a cost of 73 c. per cu. yd. Two other bids were held by the city for this contract, both offering to provide the material at 90 c. per cu. yd., according to E. L. Romary, secretary of the board of control.

The gravel purchased will be used to repair and maintain dirt streets in the city and continue the gravel road program which was started a year ago.—*Canton* (Ohio) *Repository.*

Dayton, Ohio—An expenditure of $5635 for crushed stone and boulder chips for street improvement work was made by the city commission recently.

The commission purchased from the Lima Stone Co. of Lima 12,500 tons of crushed stone at a cost of $1812.50 ($1.45 per ton). A similar amount was bought from the Laurel Gravel and Stone Co. of Phillipsburg for $1962.50 ($1.57 per ton).

The Keystone Gravel Co. and the Mad River Sand Co., both of Dayton, were each awarded contracts for 750 tons of boulder chips on their bids of $930 ($1.24 per ton).—*Dayton* (Ohio) *Herald.*

Flint, Mich.—Four bids on the 15,000 bbl. of cement to be used in the construction of the half-million dollar sewage treatment unit were received by the city commission.

The bids were as follows: Catsman Coal Co., "Peerless" cement, $2.04 per bbl., less 10 c. discount; J. P. Burroughs and Son, "Aetna" cement, $2.04, less 10 c.; C. W. Chapple Co., "Peninsular" or "Alpha" cement, $2.14, net cash; Flint Coal and Masons Supply Co., "Huron cement, $2.14, less 10 c. per bbl. discount.

The city is paying $1.99 a barrel on its contract this year, according to Harry C. McClure, director of public works, but when the cost of hauling the cement to the sewage treatment plant site is taken into consideration the prices compare favorably, he said.—*Flint* (Mich.) *Journal.*

New Cement Mill for Moravia

THOMAS BATA, the Czechoslovak mass production shoe manufacturer, is planning to establish a cement mill on American lines in Moravia. A builder from Chicago, who was called by Bata to Europe to erect cottages in Zlin for his workers, has been constructing villas in Prague according to American models for several wealthy residents. By utilizing cement manufactured according to American methods, the builder was able to reduce the cost of these houses, although a native architect pronounced it impossible.—*New York* (N. Y.) *Times.*

Oklahoma Contracts for Portland Cement

THE Oklahoma State Highway Department recently asked for bids on 1,000,000 bbl. of portland cement, f.o.b. mill. According to newspaper reports, of 11 cement companies submitting bids, the Monarch Cement Co., Humboldt, Kan., was the only one to follow the specifications calling for prices on cement at the mill.

The Oklahoma Portland Cement Co., Ada, Okla., bid 14 c. below the uniform price offered by nine other cement companies bidding on the destination price.

A member of the state highway commission suggested the mill price bid specification, with the state paying the freight, in n effort to determine if prices of different companies would be the same at the mill, it was said.

The Monarch company offered cement for $1.40 a barrel at the mill, with 10 c. off for cash. The Oklahoma Portland Cement Co. bid was based on the price at various points to which the cement would be shipped.

Contracts for 950,000 bbl. were tentatively awarded by the state highway commission on February 11 to the Oklahoma Portland Cement Co.

The Monarch Cement Co. was awarded a contract for furnishing the state with 50,000 bbl. Prices depend upon the point of delivery but range from $1.75 to $2.08, which is the lowest price the state has ever paid for cement, Chairman Sam Hawks of the commission said to local newspaper men.

Subsequently the district engineer of the United States Bureau of Public Roads refused the government's participation in the purchase with the contention that the bid on mill price by the Monarch Cement Co., Humboldt, Kan., was the only legal bid.

Attorney General J. Berry King upheld the legality of making awards of 950,000 bbl. to the Oklahoma Portland Cement Co., Ada, and 50,000 bbl. to the Humboldt company.

J. N. Dugan Re-elected President Cincinnati Gravel Association

J. N. DUGAN, of the J. N. Dugan Co., unanimously was re-elected president of the Cincinnati Gravel Producers Association, a division of Allied Construction Industries. Other officers re-elected are: B. T. Van Camp, of the Van Camp Stone Co., vice-president; Earl P. Holwadel, of the American Aggregates Corp., secretary-treasurer.

President Dugan was requested to serve as delegate to the Allied Construction Industries board of directors, with Mr. Holwadel as his alternate. To the credit board of the association the members re-elected W. A. Jurgensen, of the American Aggregates Corp. The association has a membership of seven gravel-producing firms.—*Cincinnati* (Ohio) *Enquirer.*

Improved Packing Belt

By T. N. Haffner
Chief Engineer, Keystone Portland Cement Co., Bath, Penn.

THE PACKING BELT, frame and drive illustrated were designed primarily for good operation and cleanliness. There are only two supporting legs under the main frame, and two under the apron to interfere with sweeping. The latter two legs may be readily displaced by a dust box discharging to a conveyor below, and the dust box connected to the dust exhausting system.

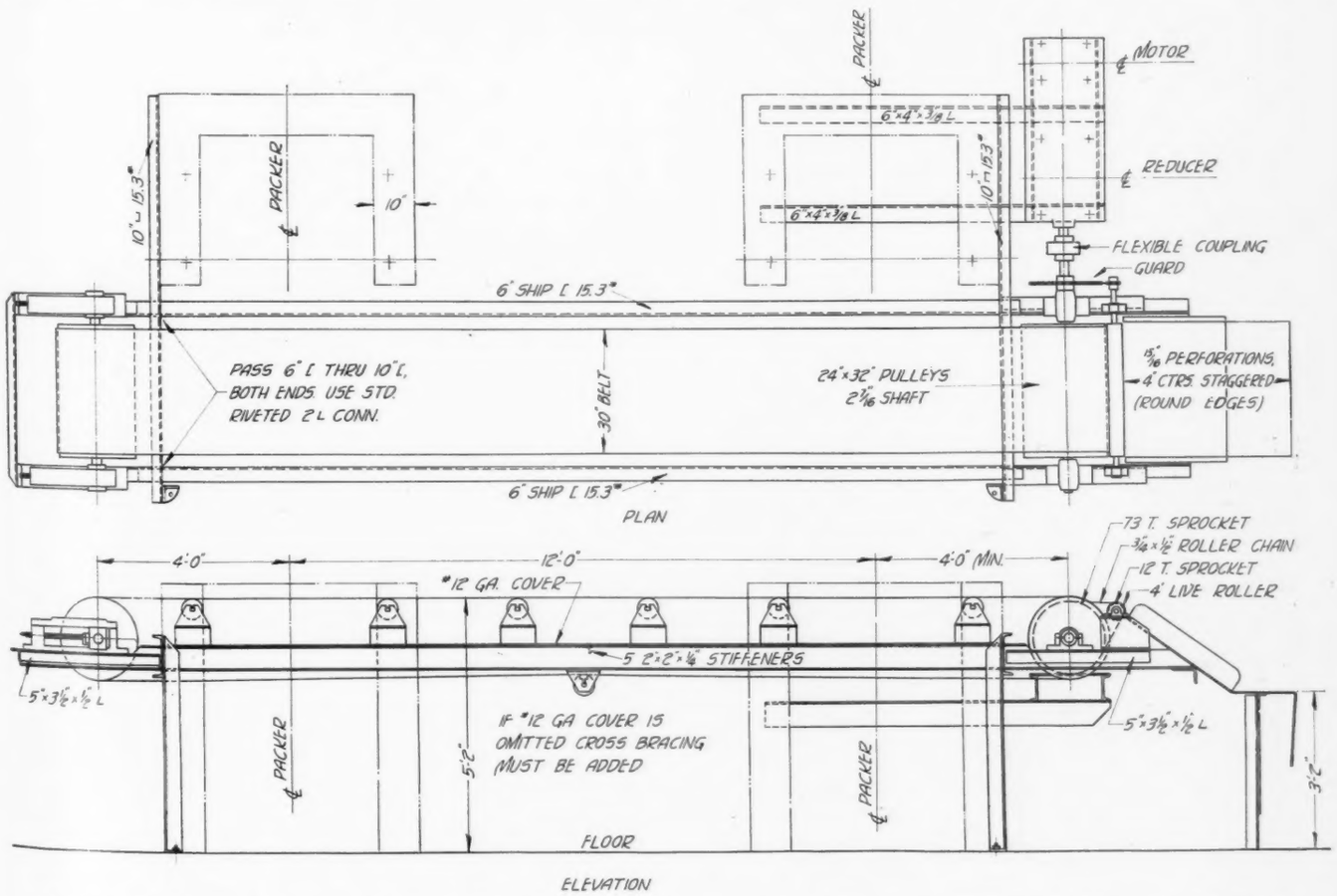
The main stringers are 6-in. ship channels passed through the 10-in. supporting channels and have 5x3½x½-in. angles welded to them at the ends for supporting head and tail shaft bearings. These bearing supports are amply stiff, the loads being quite light. The whole main part of the belt frame was fabricated complete in the structural shop, only the legs and apron being field assembled. The space between the stringers under the belt is covered with 12-gage sheet, stiffened with 2x2x¼-in. stiffeners. Crossbracing is sometimes substituted for this sheet, but is distinctly inferior, as a considerable unavoidable spill occurs on the lower belt, and collects around the tail pulley. The space between the upper belt and the sheet is easily entered with an ordinary sweeping brush, and is much easier to clean than the tail pulley.

The drive unit is supported on a structural base resting on two angles, cast directly into the concrete. A space for fillers should be allowed between the drive base and the supporting angles; also between at least one of the 10-in. supporting channels, and the concrete pier. With reasonably accurate field work 1 in. should be enough allowance for these fillers.

It may be noted that the packer piers have vertical sides throughout. The battered sides in common use are in no wise necessary for strength, do not contribute to cleanliness or ease of operation, and only take up valuable floor space with increased cost of construction. Tying the two supporting side walls together with a wall at the back gives a pier amply stiff and with the necessary dust hopper formed without more expense than a steel plate front.

The motors driving the packing machines are mounted on a suitable concrete beam spanning the space between the inner walls of the two piers. This will be found cheaper to install, easier to keep clean and giving greater accessibility to the idler pulleys than running these supports to the floor.

The packing machines in the installation described are Bates 3-tube, each driven by a 15-hp. 1200-r.p.m., General Electric motor through a Bates flexible coupling. The belt is driven by a 3-hp. 900-r.p.m., General Electric motor, through a Jones No. 15 spur gear reducer directly coupled to the pressed steel head pulley with Fast flexible couplings. The belt is 30 in. wide and runs on Dodge antifriction idlers. Head and tail pulleys are crowned, no guide idlers being used as they very materially shorten the life of the belt.



Improved packing belt, frame and drive. Motors driving packing machines are mounted on a concrete beam spanning the space between the inner walls of the two piers

Hints and Helps for Superintendents

Handling Blasting Mats

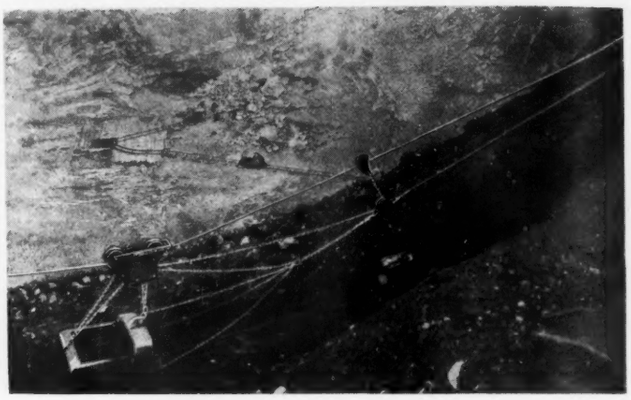
By W. L. Home
Mining Engineer, Tenafly, N. J.

BLASTING is at all times a dangerous necessity, especially in congested districts and it is remarkable how comparatively few accidents of this kind occur. However, when it is possible to save time and still decrease the hazard it would seem worth while to do so.

In the placing of steel blasting mats over a charge of dynamite about to be set off it is common practice to use a crane, shovel or derrick and pick up the mat by means of a ring usually in one corner. This leaves the mat suspended in the air, hanging awkwardly and difficult to handle. It is then placed as near as possible to where it is to be used and is then lowered over the charge. With the assistance of man-power the mat is straightened out and placed into position as expeditiously as possible but usually with a lot of dragging of the mat and walking over the detonator wires.

Some operators provide a bridle for picking up and placing the mat so that when the mat is suspended in the air by the crane it hangs in a perfect vertical plane. In this position the crane operator can lower the mat until the lower edge is exactly where it is wanted. By holding this edge stationary with almost no other help, the operator can lower the mat over the wires with almost no dragging and with the least danger of damage to the wires.

The bridles are made of a light rail with hooks on each end corresponding to the width of the mat and with chains from each end to a ring providing a sling for the crane to hook into so that when the bridle and mat are picked up the mat will be spread out its entire width and the rail will maintain itself in a horizontal position.



Close-up view of the bucket

Winter Quarry Stripping with Cableway Excavator

By R. A. Goodwin

BETWEEN its present 110-ft. quarry face and a wagon road alongside its calcining plant the Dominion Lime Co., Lime Ridge, Que., is uncovering a new section of its deposit for future quarrying, using a ⅓-cu. yd. Sauerman slackline cableway. The area that is being stripped is about 62 ft. wide back of the existing face and about 220 ft. long between the limits of good limestone at each side; it is cut into two parts by a haulage incline from the kiln plant to the quarry floor, and the section that is being uncovered first is a strip 136 ft. long from this incline to the end of good stone at one side. The cableway mast is set up beyond the end of the area so as to pile up the spoil well beyond the limit of the good limestone.

The cableway mast is set up beyond the end of the area so as to pile up the spoil beyond the good limestone

The material to be removed consists not only of the virgin earth and clay topsoil but also of rock and earth that were heaped up there during earlier stripping work; the depth is about 20 ft. as a minimum, and in places may run between 40 and 60 ft. The cableway went to work last October with the immediate objective of clearing off all overburden along the edge of the quarry which was in danger of being displaced into the pit. An opening cut was first made back of the face and the overburden along the outer edge was caved backwards into the cut. This edge of the overburden was cleared off to bedrock early in the winter, and the cut thus opened up will serve as the starting point for the coming season's operations. After the remainder of the material on this side of the incline is removed, the cableway mast is to be moved to the other end of the area and the cableway will then clear off the topsoil on the other side of the incline.

The bank on the quarry edge, through which the cableway made the opening cut, is a deposit of very hard earth and clay vary-

ing from 20 to 32 ft. deep. None of the material caves, and it has been found advantageous to blast the banks down into the cut with stumping powder. The clay digging has also been aided by equipping the bucket with a "digging chain" between the clevis at the top of the bucket and the clevis at the end of the pull cable, which forces the bucket into the material when digging. The clay was very dry during the fall because of lack of rain, and the operators diverted a part of the water from the quarry pumps into the cut; this water helped principally by "lubricating" the bucket, for as the bucket dug faster than the water penetrated the clay the softening effect on the clay was slight.

After the stripping work is finished the Dominion Lime Co. plans to use the cableway for other material-handling work on the quarry property; it is proposed to set up the mast at the top of a bank which has served as a dump, and within a 400-ft. span from this mast to handle both coal and stone to a hopper feeding industrial cars. Coal is to be carried from under a trestle at the outer end of the span to a reserve storage pile on the opposite side of a small stream, and later picked up from the pile and carried to the car-loading hopper in front of the mast. Small stone will be reclaimed from a dump beside the reserve storage pile. It will also be possible by shifting the track cable to reclaim spalls of 6-in. size and less from another dump.

The photographs accompanying this article were taken by J. G. Layne, superintendent of the Dominion Lime Co.'s plant and quarry operations.

Another view of the 1/3-cu. yd. slackline cableway excavator used in stripping operations at quarry

A Hint on Driving Sheet Steel Piling

By W. L. Home
Mining Engineer, Tenafly, N. J.

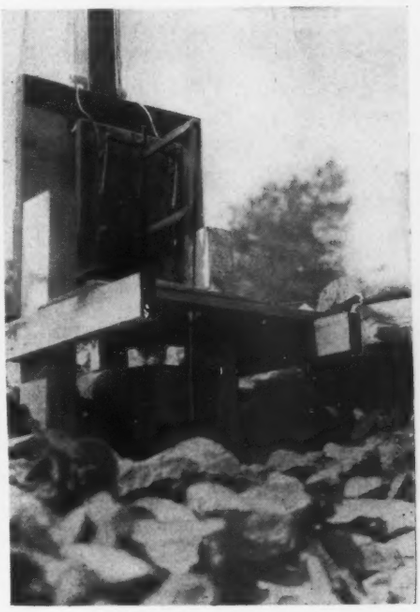
WHEN DRIVING sheet steel piling either in a continuous straight line, circle, square or any other shape and when working a series of hammers it is likely that when connecting the lines together, the last piece will not drive on account of incorrect spacing. Unless a piece of piling of the correct width can be quickly secured it is likely that the job will be delayed unless provision has been made to take care of the emergency.

Under such working conditions it is advisable to keep on hand several pieces of sheeting which are cut vertically along the center line by means of a torch. Close to each edge and using a template, drill a series of approximately ¾-in. holes. Then when there is a gap to fill in, determine the exact width that it is necessary to have the sheeting. Then, take a piece of flat iron the necessary width and thickness and drill holes in it to correspond to those drilled in the two pieces of sheeting and spaced the proper distance apart so that when the two pieces of sheeting are joined together by riveting the three pieces together, the result will be the proper width for driving. To make a piece narrower than the standard section, cut out the desired amount from original section and join as before. By having materials ready to do this, it does not require much time to make a good job.

Pumping Signals

THE United States Lime Products Co., Sonora, Calif., mines most of its limestone. The mine shaft has been driven so as to serve several levels and is provided with a sump at the bottom for collecting mine water.

The pump starts and stops through a float arrangement. Now, a direct connected motor may start with such an arrangement when the water has risen sufficiently high to operate the float but it is also possible for no water to be delivered from the pump. The suction line may be clogged, etc., and if not corrected might flood the mine pumps.



Light signal for pumping

Limestone is recovered only during the day shift and no men are kept in the mine during the remainder of the day, and as the plant is several hundred yards from the mine shaft a light signal has been provided which is so located that the kiln operator can tell if the water is actually flowing from the pump or not.

The apparatus consists of an ordinary knife blade switch to which has been attached a baffle. The baffle connects to the knife blade switch as shown by the illustration, and when water discharges from the pipe it impinges against the movable baffle and closes the signal light switch. A small spring near the floor board functions to reopen the switch when the water has stopped flowing.

Uncoiling Wire Rope

NEVER uncoil a wire rope as might be done with a rubber hose or manila rope. Lift the coil to its edge and unroll like a hoop. Beware of kinks. No amount of twisting or strain will take one out, and the rope is unsafe for work.—*Material Handling Illustrated.*

Editorial Comment

OUR PLATFORM

¶ Greater Economy of Production; the Best in Machinery, Control Equipment; High Wages; Perfect Co-ordination. ¶ Comprehensive Organization of Industry for Research, Promotion. ¶ Retirement of the State from Competition with Private Business. ¶ Active Participation of Business Men in the Business of Government. ¶ The Promotion of Safety and Welfare of the Industry's Employes.

Let's Have a Real Inquiry!

Senator Norris, of Nebraska, introduced a resolution which was adopted by the United States Senate, February 16, calling for an investigation of the cement industry by the Federal Trade Commission. One reason given by the senator is "the present widespread public interest in cement prices because of extensive public-works construction and road building." We don't know what prompted Senator Norris to ask for this investigation, but knowing the Senator's record and reputation we doubt if it was intended to do the cement industry any good.

Nevertheless, we are 100 per cent for such an investigation, honestly and conscientiously conducted, as we believe a bi-partisan or non-partisan commission should and probably will conduct it. The only qualification we could suggest is that the findings of the Commission be arrived at as promptly as possible and made public at a time when interest in the causes and cures of business depressions is still active, for the benefit of the public (and industry), which of course will pay the bill. We hope the Federal Trade Commission will really find out and expose some of the actual competitive practices that have badly demoralized, disorganized and discouraged the cement industry—while similar practices have had an equally deadening effect on other American industries.

Senator Norris is right in his resolution that the public has a large interest in cement prices. In the first place the public has an investment of about three-quarters of a billion dollars in cement mills; and on this investment the public is right now receiving negligible returns. Indeed, conscientious cement company executives are spending sleepless nights contemplating the plight of numerous widows and orphans—actually as well as figuratively—whose incomes were expected to come from well-planned, well-recommended investments in this great, growing, formerly prosperous American industry. When the first mortgage bonds of some of these companies are worth 60c to 80c on the dollar, there is no need to argue the status of cement manufacturers as alleged greedy profiteers with hard-headed men who supervise business and finance.

The public has a genuine interest in prices for cement because the ultimate scale of wages of about 40,000 Americans depends on these prices. American cement manufacturers could easily make as cheap cement as can the manufacturers of any country in Europe—provided they cut wages to the same levels. Does Senator Norris want the wages of some of his constituents in Nebraska cut to 30c or 50c per day, as probably present unemployment conditions there make possible? American cement manufacturers can sell cement at prices that will not give foreign manufacturers so much as a look at markets in the United States of America, tariff or no tariff. But along with most other American industrialists, portland cement manufacturers are determined to go through hell fire and brimstone before lowering prices via the wage-cutting route.

The public has an interest in cement prices because some $70,000,000 received from the sale of $275,000,000 worth of cement goes directly to wage earners and salaried employes. About $170,000,000 goes for materials and supplies, furnished 100 per cent by other American manufacturers and producers, whose business naturally would be proportionately less if the cement industry had less to spend. The figures given are the approximate ones for 1929. They are, probably, somewhat less for 1930; their being less, of course, is one of the million-and-one *causes*—not results—of the 1930 business depression.

The public is mightily interested in the price of cement (and of steel, lumber, textiles, etc., etc.) because some one has got to pay the piper for government generosity to hard-up farmers and ex-soldiers. The sources of government funds are taxes on the *profits* of business and industry and the *earnings* of individuals in these same businesses and industries. Even a senatorial intellect should be able to reason that if income from corporation profits is less, income from individual earnings (even though under these conditions the individual's earnings are less) must make up the difference. The man with the small income, who may not have to pay an income tax at all, ultimately pays the lion's share of the government's expenditures just the same; or of course they wouldn't be paid. The "endless-chain" process is a whole lot easier and simpler, and every one is happier when industry is allowed to make a profit and pay its share directly. But, of course, Senators like Mr. Norris don't want things so simple and easily understood by their constituents—the common people.

The public is interested in cement prices and all other commodity prices not only as a purchaser, but because the public is slowly beginning to realize that present business profits are the sources of all future business, of their own future income, as well as the sources, directly or indirectly, of all government income. Whether the Senator from Nebraska realizes it or not, there is very good reason to believe that the public's intellect has passed beyond the

stage where it believes the public itself profits by profitless business. Public opinion is slowly but surely forming to demand that government allow business and industry to make a fair profit.

We have passed over the primary reason given by Senator Norris for his resolution, namely, "that the uniformity of cement price quotations in various sections of the country is highly indicative of an arrangement among manufacturers and dealers to arbitrarily fix and maintain prices," because this particular matter of price uniformity was very completely gone into by the United States Supreme Court in 1925, and the court was convinced that this uniformity of prices was the result of competition and not evidence of the lack of it. And of course this kind of a price structure is not peculiar to the cement industry, but is fundamental to the marketing of any standardized basic commodity, for reasons so easily comprehended that we believe Senator Norris could grasp them if he would try.

The Federal Trade Commission has been investigating the price structure of the cement industry for several years, and ought by this time to be in a position to know the correctness of the Supreme Court's decision in this respect, first-hand. The Commission has the opportunity to render American industry (and therefore, of course, the American public) a genuine service by showing to what extreme lengths present unethical, unfair, unbusiness-like methods of competition are testing the moral fibre of American business men, and how, in spite of all these unnecessary hazards and pitfalls, and the constant harassing by politicians, they are conscientiously trying to do the right thing for their employes, their stockholders, their customers and the public. If their methods—and those of other American manufacturers—are devious and complicated rather than open and straightforward, it is not of their choice and the cause is not difficult to find; but the American hope and determination to conduct business successfully is there notwithstanding.

Economics of Rock Products Industry

With this issue is begun what the editor deems one of the most interesting and helpful series of articles it has been his privilege to publish. It deals with the fundamentals of the successful exploitation of rock products deposits. The author is peculiarly well qualified to deal with the subject; and Rock Products is a peculiarly excellent medium for its publication. For Rock Products has always consistently and persistently tried to drive home to producers and prospective producers these very fundamentals, which Raymond B. Ladoo has in this series of articles summarized and clarified in remarkably interesting and easily read form.

It is hoped that every subscriber of Rock Products will read and save these articles. They are sure to prove helpful and valuable to him in a variety of ways. They should be a guide to his judgment in developing or expanding his own operations; they should be helpful to him in judging the strength or weakness of his competitors; they should prove helpful to him in dealing with his bankers; they should be valuable in combating new and unnecessary prospective competition; they should prove helpful in arriving at a fair price for his product and in arriving at a fair depletion cost for his deposit.

Of course, most experienced producers know these fundamental economics of their industry from experience, but even they should be helped by having succint, codified knowledge. Prospective producers seldom know these fundamental principles at the start. Often, as Mr. Ladoo so graphically points out, the professional advice they seek and pay for, is entirely wrong. Many learn only by costly failures. If we are to have efficiency in exploitation and development as well as in operation, this costly experience must be avoided so far as possible.

Many banking houses and engineers see Rock Products regularly, and it is to be hoped these articles in particular will be noted and read by them. We also recommend them to our advertisers—machinery and equipment manufacturers. In times past they, undoubtedly, have been primarily responsible for many new operations. Most assuredly we shall have many new operations in the future, and it is not the object of these articles or of this editorial to attempt to head them off regardless. But let's have them based on sound economics, or sound business judgment, and not on entire misconceptions of the very fundamentals of the industry.

This is a peculiarly good time for this series, because we are undoubtedly on the verge of an expansion of all industry, the construction industry in particular. Those who will be most successful in this new era will be those who are best informed; those who watch trends; those who are ready to make the right step before their competitors are aware that any step at all is necessary. With the constant shifting of the center of population, of centers of industry, etc., constantly new economic and business conditions arise. It is just as foolhardy for an established producer to persist and expand in a location where the market demand may slowly but surely be obliterated, or to persist in operating an obsolete plant, as it is for the novice to build a new plant in an already over-supplied market with no primary advantages of low cost, favorable location or established customers.

The centers of the glass, chemical, porcelain, paper, steel, and a hundred other industries which furnish markets for rock products are constantly shifting—in general from the east to the central west—as for example mark the decline of Pittsburgh as a steel center in favor of Chicago, and in the future, perhaps St. Louis. The further development of our inland waterways will have profound effects upon many of these industries. It is already producing significant changes in the portland cement industry. No business is safe in these days of relatively swift economic change; and the only security a business man has is a thorough knowledge of fundamentals coupled with foresight and decision. It is the purpose of these articles to supply this needed knowledge.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	2- 9-31	93	.....	
Alpha P. C. new com.[2]	2-21-31	17	17¾	50c qu. Jan. 24
Alpha P. C. pfd.[2]	2-21-31	115	123	1.75 qu. Mar. 14
Amalgamated Phosphate Co. 6's 1936[19]	2- 4-31	99½	100½	
American Aggregates com.	2-25-31	9	15	75c qu. Mar. 1
Am. Aggr. 6's, bonds	2-25-31	73⅛	75	
American Brick Co., sand-lime brick	10- 6-30	4½	.....	25c qu. Feb. 1, '30
American Brick Co. pfd.	2-19-31	54	57	50c qu. May 1, '30
Am. L. & S. 1st 7's[27]	2- 9-31	94	.....	
American SilicaCorp. 6½'s[39]	2-24-31	No market		
Arundel Corp. new com.	2-24-31	41	.....	75c qu. Jan. 2
Beaver P. C. 1st 7's[20]	2-20-31	92	95	
Bessemer L. & C. Cl. A[4]	2-20-31	29¼	32	75c qu. Feb. 1
Bessemer L. & C. 1st 6½'s[4]	2-20-31	92	95	
Bloomington Limestone 6's[27]	2- 9-31	52	57	
Boston S. & G. new com.[37]	2-21-31	13	17	40c qu. Jan. 2
Boston S. G. new 7% pfd.[37]	2-21-31	43	47	87½c qu. Jan. 2
California Art Tile A	2-20-31	2	5½	43¾c qu. Mar. 31
California Art Tile B[40]	2-19-31	.....	4	20c qu. Mar. 31
Calaveras Cement com.	2-20-31	5	11	
Calaveras Cement 7% pfd.	2-20-31	.....	75	1.75 qu. Jan. 15
Canada Cement com.	2-23-31	12½	12⅞	
Canada Cement pfd.	2-23-31	93¾	94	1.62½ qu. Mar. 31
Canada Cement 5½'s[34]	2-20-31	100¼	100¾	
Canada Cr. St. Corp. bonds[34]	2-20-31	92	97	
Certainteed Prod. com.	2-24-31	4⅜	.....	
Certainteed Prod. pfd.	2-24-31	13	18	1.75 qu. Jan. 1
Cleveland Quarries	2-19-31	62	70	75c qu. 25c ex. Mar. 1
Columbia S. & G. pfd.	2-10-31	82	90	
Consol. Cement 1st 6½'s, A	2-24-31	No market		
Consol. Cement 6½% notes[23]	2-24-31	30	35	
Consol. Cement pfd.[27]	2- 9-31	10	20	
Consol. Oka S. & G. 6½'s[12] (Canada)	2-21-31	99	101	
Consol. Rock Prod. com.[9]	2-19-31	75c	1	
Consol. Rock Prod. pfd.[9]	2-19-31	3½	4	43¾c qu.June 1,'30
Consol. Rock Prod. units	2-23-31	8¾	10	
Consol. S. & G. pfd. (Can.)	2-23-31	.....	75	1.75 qu. Feb. 16
Construction Mat. com.	2-24-31	8⅞	9	
Construction Mat. pfd.	2-24-31	31	32	87½c qu. Feb. 1
Consumers Rock & Gravel, 1st Mtg. 6's, 1948[35]	2-19-31	77	82	
Coosa P. C.1st 6's[27]	2- 9-31	40	50	
Coplay Cem. Mfg. 1st 6's[33]	2-21-31	95	.....	
Coplay Cem. Mfg. com.[33]	2-21-31	10	.....	
Coplay Cem.Mfg. pfd.[33]	2-21-31	60	.....	
Dolese & Shepard	2-24-31	60	64	$2 qu. Jan. 2
Dufferin Pav. & Cr. Stone com.	2-23-31	7½	11	
Dufferin Pav. & Cr. Stone pfd.	2-23-31	78	.....	1.75 qu. Jan. 2
Edison P. C. com.[32]	2-20-31	50c	.....	
Edison P. C. pfd.[32]	2-20-31	2	.....	
Federal P. C. 6½'s, 1941[19]	2- 4-31	96	100	
Giant P. C. com.[2]	2-21-31	3	6	
Giant P. C. pfd.[2]	2-21-31	25	30	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.	2-23-31	11¼	11⅜	20c qu. Jan. 2
Hermitage Cement com.[11]	2-21-31	15	25	
Hermitage Cement pfd.[11]	2-21-31	75	85	
Ideal Cement, new com.	2-24-31	47	49	75c qu. Jan. 1 & 50c ex. Dec. 22
Ideal Cement 5's, 1943[29]	2-24-31	96	99	
Indiana Limestone com.[27]	2- 9-31	3	6	
Indiana Limestone pfd.[27]	2- 9-31	50	60	
Indiana Limestone 6's	2-24-31	61	61⅛	
International Cem. com.	2-24-31	60	60½	$1 qu. Dec. 31
International Cem. bonds 5's	2-24-31	99	.....	Semi-ann. int.
Iron City S. & G. bonds 6's[36]	11- 1-30	90	93	
Kelley Is. L. & T. new stock	2-19-31	34½	40	62½c qu. Jan. 2
Ky. Cons. St. com. V. T. C.[38]	2-19-31	4	6	
Ky. Cons. Stone 6½'s[38]	2-19-31	82	85	
Ky. Cons. Stone com.[38]	2-19-31	4	6	
Ky. Cons. Stone pfd.[38]	2-19-31	75	80	$1.75 qu. Feb. 1
Ky. Rock Asphalt com.[11]	2-21-31	5	7	40c qu. Oct. 1, '30
Ky. Rock Asphalt pfd.[11]	2-21-31	75	79	1.75 qu. Mar. 1
Ky. Rock Asphalt 6½'s[11]	2-21-31	90	92½	
Lawrence P. C.[2]	2-21-31	52	57	$1 qu. Dec. 29
Lawrence P. C. 5½'s, 1942[2]	2-21-31	87	.....	
Lehigh P. C.	2-24-31	18	19	25c qu. Feb. 2
Lehigh P. C. pfd.	2-24-31	99¼	104	1.75 qu. Apr. 1
Louisville Cement[7]	2-19-31	175	225	
Lyman-Richey 1st 6's, 1932[13]	2-21-31	97½	99½	
Lyman-Richey 1st 6's, 1935[13]	2-21-31	97	99	
Marblehead Lime 6's[34]	2-20-31	85	95	
Marbelite Corp. com. (cement products)	11-29-30	.....	3	
Marbelite Corp. pfd.	2-19-31	2½	.....	50c qu. Oct. 10, '30
Material Service Corp.	2-24-31	16½	20	50c qu. Mar. 1
McCrady-Rogers 7% pfd.[22]	2-19-31	45	50	87½c qu. Dec. 31
McCrady-Rogers com.[22]	2-19-31	15	20	75c Jan. 26
Medusa Portland Cement	2-19-31	65	80	1.50 Jan. 1
Michigan L. & C. com.[6]	2-21-31	45	.....	
Missouri P. C.	2-24-31	28½	29	50c qu. Jan. 31
Monolith Portland Midwest[9]	2-19-31	1¾	2½	
Monolith P. C. com.[9]	2-19-31	3	4	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	2-19-31	4	5	40c s.-a. Jan. 1
Monolith P. C. units[9]	2-19-31	10	12	
National Cem. (Can.) 1st 7's[34]	2-20-31	98½	100	
National Gypsum A com.	2-24-31	4	4¾	
National Gypsum pfd.	2-24-31	33½	35½	$1 Jan. 2
Nazareth Cement com.[25]	2-21-31	15	.....	
Nazareth Cement pfd.[25]	2-21-31	98	.....	
Newaygo P. C. 1st 6½'s[27]	2- 9-31	101	102	
New Eng. Lime 1st 6's[34]	2-20-31	60	70	
N. Y. Trap Rock 1st 6's	2-25-31	97	97½	
N. Y. Trap Rock 7% pfd.[30]	2-24-31	95	.....	1.75 qu. Jan. 2
North Amer. Cem. 1st 6½'s	2-24-31	46½	.....	
North Amer. Cem. com.[27]	2- 9-31	1½	2	
North Amer. Cem. 7% pfd.[27]	2- 9-31	13	.....	
North Shore Mat. 1st 5's[15]	2-24-31	95	97	
Northwestern States P. C.[31]	2- 9-31	98	110	$2 Apr. 1
Ohio River Sand com.	2-20-31	.....	15	
Ohio River Sand 7% pfd.	2-20-31	.....	98	
Ohio River S. & G. 6's[16]	2-21-31	90	95	
Oregon P. C. com.[20]	2-20-31	9	13	
Oregon P. C. pfd.[20]	2-20-31	87	95	
Oregon P. C. conv. pfd.	2-20-31	80	90	
Pacific CoastAggr. com.[40]	2-19-31	2	.....	
Pacific Coast Aggregates pfd.	2-23-31	2	4	
Pacific Coast Cement 6's[5]	2-20-31	65¼	74¾	
Pacific P. C., new com.	2-20-31	12	.....	
Pacific P. C., new pfd.	2-20-31	70	75	1.62½ qu. Jan. 5
Pacific P. C. 6's[5]	2-20-31	97	99½	
Peerless Cement com.[3]	2-20-31	5⅜	5¾	
Peerless Cement pfd.[3]	2-20-31	68	72	1.75 Jan. 1
Penn.-Dixie Cement com.	2-24-31	4¾	5	
Penn.-Dixie Cement pfd.	2-24-31	22½	24	
Penn.-Dixie Cement 6's	2-24-31	75½	75¾	
Penn. Glass Sand Corp. 6's	2- 4-31	101	103	
Penn. Glass Sand Corp. pfd.	2- 4-31	90	.....	1.75 qu. Jan. 1
Petoskey P. C.	2-24-31	5½	7	15c qu. Apr. 1
Port Stockton Cem. com.[9]	2-19-31	No market		
Riverside Cement com.	2-20-31	10	12	
Riverside Cement pfd.[9]	2-19-31	67½	70	1.50 qu. Feb. 1
Riverside Cement, A[20]	2-20-31	10	12	15c qu. Feb. 1
Riverside Cement, B[9]	2-19-31	1½	2	
Roquemore Gravel 6½'s[17]	2-21-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	2- 4-31	90	100	
Santa Cruz P. C. com.	2-20-31	85	.....	$1 qu. Jan. 1 & $2 ex. Dec. 24
Schumacher Wallboard com.	2-20-31	8	9	
Schumacher Wallboard pfd.	2-20-31	18	23½	50c qu. Feb. 15
Southwestern P. C. units[33]	2-19-31	240	300	
Standard Paving & Mat. (Canada) com.	2-23-31	15¾	16	50c qu. Feb. 16
Standard Paving & Mat. pfd.	2-23-31	.....	79¾	1.75 qu. Feb. 16
Superior P. C., A	2-20-31	30	32⅞	27½c mo. Mar. 1
Superior P. C., B	2-20-31	8¼	13	25c qu. Dec. 20
Trinity P. C.units[31]	2- 9-31	104	.....	
Trinity P. C. com.[31]	2- 9-31	32	32½	
Trinity P. C. pfd.[27]	2- 9-31	107	110	
U. S. Gypsum com.	2-24-31	43½	44¼	40c qu. Mar. 31
U. S. Gypsum pfd.	2-24-31	123¾	.....	1.75 qu. Mar. 31
Wabash P. C.[21]	2-21-31	18	23	
Warner Co. com.[16]	2-21-31	32	33	50c qu. Apr. 15
Warner Co. 1st 7% pfd.[16]	2-21-31	97	102	1.75 qu. Apr. 1
Warner Co. 1st 6's[8]	2-24-31	85	86	
Whitehall Cem. Mfg. com.[30]	2-24-31	80	.....	
Whitehall Cem. Mfg. pfd.[30]	2-24-31	50	.....	
Wisconsin L. & C. 1st 6's[15]	2-24-31	95	97	
Wolverine P. C. com.	2-24-31	.....	4	15c qu. Nov. 15
Yosemite P. C., A com.[9]	2-19-31	2	2½	

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Co., San Francisco, Calif. [6]Frederic H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central Trust Co. of Illinois. [16]J. S. Wilson, Jr., Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]A. B. Leach & Co., Inc., Chicago, Ill. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher & Co., Denver, Colo. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]Hemphill, Noyes & Co., New York City. [42]Nesbitt, Thomson & Co., Montreal.

Wolverine Cement's Annual Statement

THE Wolverine Portland Cement Co., Coldwater, Mich., reports a balance sheet and a profit and loss statement for the year ending December 31, 1930, as follows:

CONDENSED OPERATING STATEMENT OF THE WOLVERINE PORTLAND CEMENT CO. FOR THE YEAR ENDED DECEMBER 31, 1930

Net sales		$590,788.84
Cost of goods sold (exclusive of depreciation and depletion)	426,392.33	
Gross profit (exclusive of of depreciation and depletion)		$164,396.51
Depreciation	59,743.86	
Depletion	5,252.65	
Total depreciation and depletion		64,996.51
Gross profit		99,400.00
Selling expenses	$ 44,050.68	
Administrative expenses	25,563.20	
Total expenses		69,613.88
Operating profit		29,786.12
Plus: Non-operating income (net)		6,609.38
Net profit for year before income tax		36,395.50
Less: Provision for income tax		4,357.33
Net profit for year		$ 32,038.17

SURPLUS ACCOUNT

Balance, Jan. 1, 1930		$198,114.61
Plus: Net profit for year as shown above		32,038.17
		$230,152.78
Less: Cash dividends paid	$60,000.00	
Provision for valuation of investments	4,660.00	
Provision for bad debt losses	1,500.00	
Additional income tax for 1928	287.32	66,447.32
Balance, Dec. 31, 1930		$163,705.46

During the year the company installed at its Quincy plant one 10x310-ft. kiln to replace seven smaller ones, which had been in operation 30 years, at an installation cost of $165,000. Some $65,000 additional was invested in more acreage, rights-of-way and bridges, at the Quincy plant.

Recent Dividends Announced

Alpha P. C. pfd. (qu.)	$1.75	Mar. 14
Canada Cement pfd. (qu.)	1.62½	Mar. 31
Kentucky Rock Asphalt pfd. (qu.)	1.75	Mar. 1
Limestone Prod. 7% pfd. (qu.)	0.62½	Apr. 1
U. S. Gypsum com. (qu.)	0.40	Mar. 31
U. S. Gypsum pfd. (qu.)	1.75	Mar. 31
Warner Co. com. (qu.)	0.50	Apr. 15
Warner Co. 1st. and 2nd pfd. (qu.)	1.75	Apr. 1

CONDENSED BALANCE SHEET OF THE WOLVERINE PORTLAND CEMENT CO. DECEMBER 31, 1930

ASSETS

Current assets			
Cash on hand and in banks		$ 126,571.58	
Investments (at cost) plus accrued interest	$ 48,837.09		
Less: Reserve for valuation	4,660.00	44,177.09	
Notes and accounts receivable	36,873.72		
Less: Reserves for bad debts and discounts	4,004.30	32,869.42	
Inventories		304,880.91	
Total current assets			$ 508,499.00
Fixed assets			
Land, clay and marl deposits	$ 142,611.55		
Less: Reserve for depletion	86,063.70	56,547.85	
Plant and equipment	$1,441,254.72		
Less: Reserve for depreciation	788,998.66	652,256.06	
Total fixed assets			$ 708,803.91
Deferred and other assets			7,710.21
Total assets			$1,225,013.12

LIABILITIES

Current liabilities		
Accounts payable	$ 14,738.64	
Accrued expenses	2,211.69	
Provision for income taxes	4,357.33	
Total liabilities		$ 21,307.66

CAPITAL

Capital stock outstanding—100,000 shares, par value $10.00 per share	$1,000,000.00	
Surplus—Earned and unappropriated	163,705.46	
Earned and appropriated as reserve for fire insurance	$40,000.00	203,705.46
Total capital		1,203,705.46
Total liabilities and capital		$1,225,013.12

Dolese and Shepard Co.'s Annual Report

THE ANNUAL REPORT of the president of the Dolese and Shepard Co. (Col. O. P. Chamberlain), producer of crushed stone in the Chicago, Ill., territory, contains the following comments:

The company has just passed through a year of small demand, low prices and little profit in all lines connected with building industry; the crushed-stone industry has shared in the general depression. It has been estimated that the volume of the building material business in the Chicago district, measured in dollars, was in 1930 but 31% of the business of 1929.

The sales of crushed stone were 245,579 cu. yd., or 33% less than for the year 1929. Production dropped 215,994 cu. yd., 29% as compared with 1929. With this reduced volume, unit costs were naturally higher than for 1929.

The net revenue from the Hawthorne disposal station amounted to $46,004.44 or 17% less than for the year 1929. This decrease also can be attributed mainly to a falling off in foundation and construction work for 1930.

There was expended $6,255.19 for new equipment in 1930; consisting of one vibrator screen, one hopper bin and 10 gondola cars. The plant remains in good physical condition, kept so by adequate repairs and replacements.

The reserve fund remains intact, consisting of high grade bonds totalling $216,253.48, the minimum interest rate of which is 4%.

The dividend rate of $8 per share was maintained during the year 1930 and there was paid out to stockholders, $153,184.00.

The building material industry in 1930 was notable for the furthering of consolidations of corporations that manufacture, wholesale and retail building materials; the manufacturing part of their business including crushed stone, sand, gravel, and face brick for buildings. There are now three such corporations in Chicago that practically dictate the policies of retail distribution of building materials. Dolese and Shepard Co. stands alone as a producer and wholesaler of crushed stone only. It is the company's president's belief that its independent position and economic operation and manage-

INACTIVE ROCK PRODUCTS SECURITIES (Latest Available Quotations)

Stock	Price bid	Price asked
American Portland Cement,[3] 100 shs., par $10	$100 for the lot	.....
American Portland Cement,[3] 400 shs., par $10	$400 for the lot	.....
American Portland Cement,[3] 100 shs., par $10	$75 for the lot	.....
Atlantic Gypsum Products 1st 6s, 1941 ($28,000)[3]	$7400 for the lot	.....
Blue Diamond Materials, 10 shs. pfd.[5]	$10 for the lot	.....
Florida Portland Cement (Del.),[3] 50 shs. com., no par and 50 pfd.	$450 for the lot	.....
Florida Portland Cement, 10 shs. pfd. and 5 shs. com.[6]	$100 for the lot	.....
Indiana Limestone, 200 shs. pfd. and 1000 com., no par[4]	$2000 for the lot	.....
Rockland and Rockport Lime, 330 shs. pfd., 85 2nd pfd. and 135 com.[10]	$55 for the lot	.....
Rockland and Rockport Lime Corp., 50 shs. 1st pfd.[11]	$40 for the lot	.....
Standard Rock Asphalt, 1200 shs. no par stock[4]	1¼	.....
Tory Hill Sand and Gravel, 13 shs. 8% pfd.[8]	$1 for the lot	.....
Tory Hill Sand and Gravel, 13 shs. com., no par[8]	$1 for the lot	.....
United Feldspar, 388 shs. pfd., 647 com.[9]	$1000 for the lot	.....
Universal Gypsum, 100 trustees cert., no par[7]	$1 for the lot	.....
Universal Gypsum, 500 shs. com., no par[9]	$12 for the lot	.....
Universal Gypsum and Lime, 300 shs.[1]	$4 for the lot	.....
Universal Gypsum and Lime, 200 shs.[1]	$2 for the lot	.....
Vulcanite Portland Cement, 300 shs. com., no par[8]	$425 for the lot	.....

[1]Price at auction by Adrian H. Muller & Son, New York, August 6, 1930. [2]Price at auction by Adrian H. Muller & Son, New York City, November 19, 1930. [3]Price at auction by Adrian H. Muller & Son, New York City, December 10, 1930. [4]Price at auction, Adrian H. Muller & Son, December 24, 1930. [5]Price at auction, R. L. Day & Co., Boston, December 17, 1930. [6]Price at auction, Barnes & Lofland, Philadelphia, December 17, 1930. [7]Price at auction, A. J. Wright & Co., Buffalo, December 17, 1930. [8]Price at auction, Adrian H. Muller & Son, December 17, 1930. [9]Price at auction, Adrian H. Muller & Son, December 31, 1930. [10]Price at auction, R. L. Day & Co., December 31, 1930. [11]Price at auction, Wise, Hobbs & Arnold, Boston, December 31, 1930.

ment in this environment will within a comparatively short period of time, result in the business being benefited and profits increased by these new conditions.

One feature of the 1930 business was encouraging to the company. While total sales fell off 33% from 1929, sales and deliveries outside of the Chicago switching district were 4% greater in 1930 than in 1929.

With the prospect of a light demand for the product this year in Cook county, special efforts are being made to extend the business outside the Chicago switching district.

COMPARISON OF BALANCE SHEETS OF THE DOLESE AND SHEPARD CO.
(At December 31, 1930 and 1929)

ASSETS	1930	1929
Currents assets:		
Cash on hand and in bank	$53,134.50	$125,838.10
Marketable securities —at cost	216,253.48	216,253.48
Accounts rceivable	43,346.38	40,988.66
Notes receivable	2,360.00	1,800.00
Mortgage note receivable	16,785.00	16,785.00
Interest receivable	4,101.76	3,537.08
Inventories	95,237.82	80,342.53
Prepaid expenses	2,333.68	4,915.78
Total current assets	$433,552.62	$490,460.63
Capital assets:		
Plant and equipment	$1,083,076.74	$1,192,782.64
Less depreciation reserve	603,167.87	685,039.82
Plant and equipment —net	$479,908.87	$507,742.82
Real estate—net	572,616.11	570,036.73
Total capital assets	$1,052,524.98	$1,077,779.55
	$1,486,077.60	$1,568,240.18
LIABILITIES		
Current liabilities:		
Accounts payable	$7,547.83	$5,231.53
Dividend payable January 2	38,296.00	57,444.00
Local tax reserve (2 years)	54,000.00	28,957.09
Income tax reserve	11,894.78	22,606.33
Total current liabilities	$111,738.61	$114,238.95
Net worth:		
Capital stock outstanding	$957,400.00	$957,400.00
Surplus, December 31	416,938.99	496,601.23
Net worth	$1,374,338.99	$1,454,001.23
	$1,486,077.60	$1,568,240.18

Status of the Kentucky Consolidated Stone Co.

E. W. HAYS AND CO., bankers, Louisville, Ky., have issued a circular letter on the securities of the Kentucky Consolidated Stone Co., crushed-stone quarry operators, an abstract of which follows:

"The Kentucky Consolidated Stone Co. was organized May 1, 1928. At that time $1,000,000 first mortgage 6½% bonds and 6000 shares of 7% cumulative preferred stock were issued. As of February 1, 1931, the sinking fund has retired $185,000 of the first mortgage bonds and 827 shares of the 7% preferred stock. The company has already forwarded to the Baltimore Trust Co., trustee, $35,000 anticipating the sinking fund payment due May 1, 1931. The current position is strong with net quick assets in the ratio of 3 to 1 and no bank or other indebtedness other than current obligations.

"It has been the policy of the company to charge a very heavy depreciation and depletion reserve which has amounted in this period to a total of $402,920.31. While the net earnings for the year ended May 1, 1931, will not equal the year 1930 due to drought conditions and the cessation of railroad business, they will be satisfactory. The company will begin the year 1931 with the largest unfilled tonnage in its history. The contracts on hand and the road building program of the state highway department would seem to justify the prediction that the year 1931-32 will be the best the company has enjoyed to date.

New President Elected

"Monro B. Lanier has been managing director of the company since July 1 and Sterling Lanier has recently been elected president of the company. Both of these men have had a long experience in the business and have been associated with the company since its inception. A. J. Hoffman, the founder, resigned as president to head the General Aggregates Corp., of Memphis, Tenn., but remains as a director."

Plan for Readjustment of Financial Structure of Atlantic Gypsum Products Co.

FINANCIAL BACKERS of the Atlantic Gypsum Products Co., Boston, Mass., together with investment bankers who sold the first mortgage bonds of this company, have prepared and issued to bondholders a proposed plan for readjustment of the present financial structure of the company and for its further financing.

Due to severe competitive conditions in the gypsum industry, and latterly to depression in the building trades, the company has been forced into a top-heavy financial structure with a resultant excessive annual interest load. In carrying this load to date and continuing in operation through a long period of adverse conditions it has exhausted its working capital.

To meet this situation the proposed plan offers to bondholders either new securities (bonds and common stock) in the readjusted company, or cash. The supporters of the plan also underwrite the subscription providing the necessary new money, although the subscription is offered pro rata to all holders of interest bearing securities.

If the total amount of bonds (including present large holdings by the supporters of the plan) accepting either option is sufficient to make the plan operative, a comparable offer will be made to holders of all other interest bearing securities.

Response to date from bondholders indicates that the proposed plan can be made effective, says an authoritative statement, which continues: Upon the completion of the readjustment and refinancing, and if the plan becomes operative, the company will be placed in a strong current position, and free from practically all the present interest load, unless earnings from operations are substantial. With the company's plants in excellent physical condition and with low operating costs made possible by improvements of the last two years, the company should be in a position to benefit substantially from operations under improved building conditions.

Waukesha Lime and Stone Co. to Retire Some of Its Bonds

THE First Wisconsin Trust Co., of Milwaukee, as trustee of the Waukesha Lime and Stone Co.'s $400,000 first mortgage 6% bonds, due 1937, has notified bondholders of proposal to retire outstanding bonds.

The interest due on these bonds on January 1, 1931, was not paid on time. The company had 30 days in which to correct the default and within that time the interest was paid.

In 1930, H. M. Halverson, president of the company, died and through his death the trustee received about $150,000 as payment on Mr. Halverson's insurance. That money, according to present plans of the trust company, will be used to retire some of the outstanding bonds.

With this in mind, the trust company has sent out letters to bondholders which state that the trustee will receive sealed tenders of bonds for purchase with funds in its hands up to the close of business on May 1, 1931. Bonds tendered must be accompanied by all unpaid coupons. The trustee may reject any or all bids.

If the trustee does not receive sufficient tenders from bondholders within the period stipulated some bonds will be called in July.

Warner Co.'s Annual Report

NINETEEN-THIRTY constituted the first full year of Warner Co., Philadelphia, Penn., operation since acquiring the extensive plants, marine operations and distributing organizations of the Charles Warner Co. and the Van Sciver Corp. The year just closed was a succession of recessions in line with general experience throughout the United States. The company's operations were satisfactorily sustained in the heavy construction field, but as generally experienced, residential construction markets were heavily curtailed. Also during the late summer and fall season the unusual and prolonged drought caused a considerable lag in agricultural lime sales.

During the year the company completed the acquisition, through cash and deferred payment contract, of the balance of the outstanding preferred and common stock of the American Lime and Stone Co. and now controls these equities entirely. The American Lime and Stone Co., specializing in certain

highway stone and chemical lime products, showed still further increase in earnings for 1930 as compared with any previous year under Warner management.

The combined income of Warner Co. and American Lime and Stone Co. for 1930 amounts to $3.19 per share on Warner common stock issued and outstanding December 31, 1930.

The accompanying income statement and balance sheet show a satisfactory weathering of the past 15 months' depression and a strong financial condition.

During approximately 21 months since organization of the company in April, 1929, the company has retired $2,501,300 of its obligations underlying the common stock and further improved its plants and equipment, particularly in development of distributing terminals and concrete mixing plants, in the amount of $1,675,600. During this period the company received $1,112,000 from sale of common stock through the exercise of stock purchase warrants. Hence, the common stock position has been strengthened from reserve accumulations and undivided profits to the net amount of $3,064,900. Included in the amount of retired senior obligations is $396,000 of anticipated sinking fund requirements for early 1931. It was decided to utilize year-end surplus cash in this way rather than invest in low yield short term securities.

The physical consolidation of the various Warner and Van Sciver plants and retail distributing terminals called for many expenditures of an unusual and non-recurrent character. These could not be set up as capital outlays, although contributing largely to new economies in operation. The costs for 1930 have had to include extensive expenditures of this kind.

The company has continued actively in the development of "Central - Mix" concrete, which is greatly strengthening its position in the distributing markets where retail operations are carried on.

The forecast of 500,000 cu. yd. of "Central-Mix" concrete in 1930 was approximately accomplished and contributed to the satisfactory earning condition despite the general business depression prevailing.

The forecast for 1931 will require additions to the concrete plants and trucking equipment sufficient to handle 750,000 cu. yd. of this "ready-to-use" product, an increase of about 50%. During the past year the company established a "Central-Mix" concrete plant at its Wilmington retail terminal and has now appropriated funds for a like development at its Morrisville terminal, adjacent to the large Trenton market.

The general forecast for 1931 indicates a gradual but steady improvement in all lines of business in which the company is engaged. The larger volume will unquestionably come during the second half of the year. It is reasonable to expect a sales volume at least as good as 1930 with decreased operating charges, which should result in a gain in income applicable to dividends.

CONSOLIDATED BALANCE SHEET OF THE WARNER CO., DECEMBER 31, 1930

ASSETS

Current assets:		
Cash		$ 470,364.05
Accounts receivable	$ 966,833.76	
Notes receivable	251,055.79	
	$1,217,889.55	
Less reserve for doubtful accounts	27,911.13	1,189,978.42
Inventories (lower of cost or market)		849,483.86
Total current assets		$ 2,509,826.33
Investments in controlled and other companies:		
Controlled:		
American Lime and Stone Co. (a)	$440,486.00	
Blue Diamond Co. of Philadelphia (b)	74,848.58	
King Farms Co. (c)	51,000.00	
Other	272,601.88	
Total investments		838,936.46
Fire insurance, workmen's compensation and sinking funds		179,944.84
Property, including land, mineral deposits, buildings, equipment, etc.	$23,607,404.32	
Less reserves:		
Depletion	$ 769,157.37	
Depreciation	6,434,133.03	7,203,290.40
Property (net value)		16,404,113.92
Deferred charges:		
Prepaid insurance, licenses, taxes, etc.	$ 47,882.90	
Bond discount and expense (unamortized)	523,411.19	
Development, repairs and miscellaneous	157,379.55	
Total deferred charges		728,673.64
Total assets		$20,661,495.19

LIABILITIES

Current liabilities:		
Accounts payable		$ 130,402.47
Dividends payable—common		117,327.00
Accrued federal income tax (d)		141,466.03
Accrued interest and ground rents		106,204.18
Other accruals		28,884.97
Total current liabilities		$ 524,284.65
First mortgage 6% sinking fund bonds		6,140,000.00
Mortgage (Burlington Island)		45,000.00
Ground rents (principal)		365,000.00
Leasehold purchase contract		358,000.00
Purchase money obligations:		
Arsenal mineral deposits ($121,500 payable semi-annually, June and December)	$ 448,500.00	
For capital stock (George A. Sinn, Inc.)	251,099.95	699,599.95
Reserves for fire insurance, workmen's compensation, and miscellaneous		190,776.37
Capital stock:		
First preferred stock (27,326 shares)	$2,732,600.00	
Second preferred stock (54,500 shares)	5,450,000.00	
Common stock (no par), 234,657 shares paid-in value	$3,223,708.70	
Acquired surplus	477,811.20	
Earned surplus	454,714.32	4,156,234.22
Total liabilities		12,338,834.22
		$20,661,495.19

(a) Book value—3500 shares preferred stock, $483,000; 10,000 shares common stock, $544,983.46; total, $1,027,983.46.
(b) Book value—none. (c) Book value—$51,000. (d) Federal income tax has been computed at 11% on taxable income.

ANALYSIS OF SURPLUS, JANUARY 1 TO DECEMBER 31, 1930

Allocation by board of directors as per pro forma balance sheet as adjusted January 1, 1930		$ 495,972.87
Less:		
Additional federal income taxes of predecessor companies for year 1928	$ 4,869.63	
Sundry adjustments made in 1930 applicable to period January 1 to April 6, 1929	13,292.04	18,161.67
Surplus at date of acquisition April 6, 1929 (adjusted)		$ 477,811.20
Earned surplus January 1, 1930	$ 360,912.86	
Net income January 1, to December 31, 1930, per consolidated statement of income and profit and loss	1,273,582.38	1,634,495.24
		$ 2,112,306.44
Dividends:		
First preferred	$ 201,666.50	
Second preferred	393,866.67	
Common	584,247.75	1,179,780.92
Surplus at date of acquisition, April 6, 1929 (adjusted)	$ 477,811.20	
Earned surplus December 31, 1930	454,714.32	
Total surplus, December 31, 1930		$ 932,525.52

CONSOLIDATED STATEMENT OF INCOME AND PROFIT AND LOSS, JANUARY 1 TO DECEMBER 31, 1930

Gross sales		$12,474,132.51
Less: Costs	$8,571,602.59	
Depreciation and depletion	1,191,184.12	9,762,786.71
		$ 2,711,345.80
Wholesale sales expense	$ 228,299.47	
Administrative expense	290,579.84	
Provision for credit losses	71,386.00	
Discount allowed	327,136.80	$ 917,402.11
Net profit		$ 1,793,943.69
Interest received from various sources	$ 22,252.92	
Discount earned	122,613.14	144,866.06
Gross income		$ 1,938,809.75
Bond and other interest paid	$ 458,154.67	
Amortization of bond interest and expense	40,989.51	499,144.18
Operating income		$ 1,439,665.57
Provision for federal income tax	$ 141,466.03	
Adjustments (net)	24,617.16	166,083.19
Net income		$ 1,273,582.38

NOTES: Warner Co. had an equity in the undistributed net income (before deducting losses from abandoned plant and other surplus charges) of American Lime and Stone Co. for the year ended December 31, 1930, amounting to $71,066.00, which is not reflected in the consolidated income reported above, but which if added would indicate earnings of $3.19 per share on Warner Co. outstanding common stock.

For the same period there was no net income attributable to either the capital stock of the Blue Diamond Co. of Philadelphia or of the King Farms Co., the remaining unconsolidated subsidiaries.

Traffic and Transportation

Car Loadings of Sand and Gravel, Stone and Limestone Flux

THE following are the weekly loadings of sand and gravel, crushed stone and limestone flux (by railroad districts) as reported by the Car Service Division, American Railway Association, Washington, D. C.:

CAR LOADINGS OF SAND, GRAVEL, STONE AND LIMESTONE FLUX

District	Limestone Flux Week ended Jan. 24	Limestone Flux Week ended Jan. 31	Sand, Stone and Gravel Week ended Jan. 24	Sand, Stone and Gravel Week ended Jan. 31
Eastern	1,107	1,152	926	1,053
Allegheny	1,515	1,367	1,212	1,466
Pocahontas	83	91	407	412
Southern	527	515	5,403	6,024
Northwestern	142	192	841	1,131
Central Western	406	321	2,675	3,051
Southwestern	340	413	2,517	3,067
Total	4,120	4,051	13,981	16,204

COMPARATIVE TOTAL LOADINGS, BY DISTRICTS, 1930 AND 1931

District	Limestone Flux Period to date 1930 Feb. 1	Limestone Flux Period to date 1931 Jan. 31	Sand, Stone and Gravel Period to date 1930 Feb. 1	Sand, Stone and Gravel Period to date 1931 Jan. 31
Eastern	8,988	5,300	7,610	5,028
Allegheny	10,484	6,616	10,658	6,423
Pocahontas	866	380	2,229	1,845
Southern	2,418	2,227	25,669	25,560
Northwestern	1,921	907	3,613	4,334
Central Western	2,067	1,842	19,933	14,035
Southwestern	1,382	1,304	13,941	13,085
Total	28,126	18,576	83,653	70,310

COMPARATIVE TOTAL LOADINGS, 1930 AND 1931

	1930	1931
Limestone flux	*28,126*	*18,576*
Sand, stone, gravel	*83,653*	*70,310*

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of February 21:

SOUTHERN FREIGHT ASSOCIATION DOCKET

53852. **Sand, gravel, stone, slag and chert,** from and to points on the S. A. L. Ry. in Florida. It is proposed to amend Section 2 of Agent Glenn's I. C. C. A655, by eliminating the following restriction in connection with the rates having interstate application between points in Florida: "(Not applicable between points in Florida via S. A. L. Ry.)"

53876. **Marble, crushed, ground or pulverized,** from Tate, Ga., to Cumberland, Md. Present rate, 910c per net ton. Proposed rate on stone, viz., marble, crushed, ground or pulverized, carloads, minimum weight 60,000 lb., from Tate, Ga., to Cumberland, Md., 462c per net ton, same as currently in effect to Baltimore, Md.

53904. **Limestone or marble, ground or pulverized,** Cartersville, Ga., to Kingsport, Tenn. Present rate, 283c per net ton (combination). Proposed rate on limestone or marble, ground or pulverized, carloads (See Note 1), except when car is loaded to full visible capacity, actual weight will apply, from Cartersville, Ga., to Kingsport, Tenn., 203c per net ton.

53926. **Granite or stone, rubble or crushed,** points in North Carolina to Wissahickon, Penn. Present rate, $3.85 per net ton. Proposed rate on granite or stone, rubble or crushed, carload minimum weight 60,000 lb. (subject to Notes 13 and 14 of Southern Ry. I. C. C. A9979), from Albemarle, Bear Poplar, Cooleemee, Crescent Siding, Granite Quarry, Greensboro, Mt. Airy, Mt. Ulla, Rockwell, Salisbury, Winston-Salem and Woodleaf, N. C., to Wissahickon, Penn., $3.24 per net ton, same as currently in effect to Philadelphia, Penn., and group points.

53927. **Ganister rock,** from Piedmont, Anniston and Rock Run, Ala., to Fort Payne, Ala., Rome, Ga., Ensley, Ala. It is proposed to cancel, on the obsolete theory, the present rates on ganister rock ground or not ground, in packages or in bulk, carloads (See Note 1), from and to the above named points, published in Southern Ry. I. C. C. A10054. Eighth class rates to apply after cancellation.

53992. **Sand, gravel, etc.,** from Red Bay, Ala., to Franklin, Tenn. Present rate combination. Proposed rate on sand, gravel, etc., as described in Agent Glenn's I. C. C. A-655, from Red Bay, Ala., to Franklin, Tenn., 145c per net ton, applicable via I. C. R. R., Haleyville, Ala., Northern Alabama Ry., Tuscumbia, Ala., thence L. & N. R. R. The proposed rate is made on joint scale in I. C. C. Docket 17517.

54001. **Sand and gravel** from Elizabethton, Tenn., to N. & W. Ry. Saltville Branch and North Carolina extension stations. At present lowest combination rates apply. It is proposed to establish rates on sand and gravel, carloads (See Note 3), from and to the above named points on basis of I. C. C. Docket 15216 (Buckland), joint line scale. Statement of the proposed rates will be furnished upon request.

54039. **Sand and gravel,** from Petersburg, Puddledock and Hopewell, Va., to Cross, Wardville, Beckford Jct., Trotville, Hobbsville and Gliden, N. C. Present rate, 169c per net ton. Proposed rate on sand and gravel, carloads (description and carload minimum weight the same as at present published between these points), from and to the above named points, 140c per net ton, same as currently in effect to Sunbury, N. C.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

CENTRAL FREIGHT ASSOCIATION DOCKET

27239. To establish on **lime, common hydrated, quick or slaked** (except agricultural or fluxing lime, having no commercial value for chemical or building purposes), minimum weight 30,000 lb., from Durbin, O.

To	Rate to basing pt.	Beyond	Prop. thru rate
Appleton, Wis.	18	7.5	25½
Chippewa Falls, Wis.	18	10.5	28½
Eau Claire, Wis.	18	10.5	28½
Fond du Lac, Wis.	18	10	28
Green Bay, Wis.	18	7.5	25½
Jonesville, Wis.	18	12	30
Kaukana, Wis.	18	7.5	25½
La Crosse, Wis.	18	10.5	28½
Menasha, Wis.	18	7.5	25½
Neenah, Wis.	18	7.5	25½
Oshkosh, Wis.	18	10	28½
Rhinelander, Wis.	18	10.5	28½
Watertown, Wis.	18	10	28
Wausau, Wis.	18	10.5	28½
Wisconsin Rapids, Wis.	18	10.5	28½
Allen's Grove, Wis.	18	12.5	30½
Avalon, Wis.	18	12.5	30½
Clinton Junction, Wis.	18	12.5	30½
Darien, Wis.	18	12.5	30½
Delavan, Wis.	18	12.5	30½
Elkhorn, Wis.	18	12.5	30½
Lyons, Wis.	18	12.5	30½
Mayhews, Wis.	18	12.5	30½
Morgan's Farm, Wis.	18	13	31
Peck's Station, Wis.	18	12.5	30½
Porters, Wis.	18	13	31
Riton, Wis.	18	13	31
Springfield, Wis.	18	12.5	30½
Troy Center, Wis.	18	12.5	30½
Walworth, Wis.	18	13	31
Zenda, Wis.	18	13	31

Basing point Menominee, Mich. Present rates, sixth class.

27250. To establish on **agricultural lime** (having no commercial value for building or chemical purposes), minimum weight 40,000 lb., from Annandale, Princeton, Harrisville, Osbornes and Wick, Penn., to points in Pennsylvania, rates as illustrated in Exhibit A attached.

EXHIBIT A

Rates in cents per 2000 lb. To representative points, and delivering line

	Prop.	Pres.
Aliquippa, Penn. (P & L. E. R. R.)	155	160
Altoona, Penn. (Penn. R. R.)	185	350
Bridgeville, Penn. (P. & W. V. Ry.)	155	160
Brownsville, Penn. (Monongahela Ry.)	175	250
Clearfield, Penn. (B. R. & P. Ry.)	175	190
Clearfield, Penn. (Penn. R. R.)	230	370
Connellsville, Penn. (B. & O. R. R.)	165	250
Cooks Mills, Penn. (B. & O. R. R.)	215	350
Du Bois, Penn. (B. & S. R. R.)	175	290
Emporium, Penn. (Penn. R. R.)	230	280
Fernwood, Penn. (Pittsb. & Susq.)	210	380
Johnstown, Penn. (B. & O. R. R.)	230	260
Johnstown, Penn. (Penn. R. R.)	165	260
Kushequa, Penn. (Mt. J. K. & R. R. R.)	210	250
Leckrone, Penn. (Monongahela Ry.)	185	250
Library, Penn. (Montour R. R.)	145	160
Lock Haven, Penn. (N. Y. C. R. R.)	240	380
McKeesport, Penn. (B. & O. R. R.)	135	180
McKeesport, Penn. (P. & L. E. R. R.)	135	160
McKeesport, Penn. (Penn. R. R.)	135	160
Philipsburg, Penn. (N. Y. C. R. R.)	195	370
Philipsburg, Penn. (Penn. R. R.)	215	370
Rockwood, Penn. (B. & O. R. R.)	185	260
Rockwood, Penn. (W. Md. Ry.)	195	260
Sagamore, Penn. (B. & S. R. R.)	175	290
Smethport, Penn. (P. S. & N. R. R.)	210	250
Smith Summit, Penn. (P. & S. R. R.)	175	250
West Alexander, Penn. (B. & O. R. R.)	175	200
West Point Marion, Penn. (Monongahela Ry.)	195	250

27257. To establish on **limestone, agricultural** (not ground or pulverized), in bulk, in open-top cars; **stone, crushed,** in bulk, in open-top cars, and **stone screenings,** in bulk, in open-top cars, in straight or mixed carloads (See Note 3), from Carey, O., to Beech, Mich., rate of 117c per net ton. Route—Via C. & O. Ry., Toledo, O., and P. M. Ry. Present rate, classification basis.

27230. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), carloads (See Note 3), from Elkhart, Ind.

To	Prop.	Pres.
Michigan City, Ind., via C. S. S. & S. B.	88	102
Michigan City, Ind., via C. I. & L.	88	102
Michigan City, Ind., via M. C.	88	270
Michigan City, Ind., via N. Y. C. & St. L.	88	102
Michigan City, Ind., via P. M.	88	102
New Buffalo, Mich., via M. C.	88	101
New Buffalo, Mich., via P. M.	88	102

27197. To cancel commodity rates on **limestone, crushed or ground,** carloads, from Quincy and Marblehead, Ill., to points in Indiana, Michigan and Ohio, named in Item 1440 of W. T. L. Tariff 58N, as shown in Exhibit A attached, and allowing the basis of 60 per cent of sixth class rate provided in Item 1670-A of C. F. A. L. Tariff 130-T to apply in lieu thereof.

EXHIBIT "A"

Limestone, Crushed or Ground, Carloads, Per 100 Lb.

(Item 1440, W. T. L. 58N) (60 per cent of 6th Class) (Item 1670-A, C. F. A. 130-T)	From Quincy, Ill. Pres. (1)	From Marblehead, Ill. Prop. (2)
Akron, O.	19	17½
Ashtabula, O.	20	18½
Cincinnati, O.	16½	15½
Cleveland, O.	19	17½
Columbus, O.	18	16½
Dayton, O.	16½	15½
Delphi, Ind.	15	14
Detroit, Mich.	18	17
Elkhart, Ind.	16	14½
Evansville, Ind.	15	14
Fort Wayne, Ind.	16	14½
Huntington, Ind.	15½	14
Indianapolis, Ind.	15½	14
Kalamazoo, Mich.	16½	15½
Lafayette, Ind.	14½	13½
Logansport, Ind.	15	14
Michigan City, Ind.	15½	14
Muncie, Ind.	16	14½
Owosso, Mich.	18½	17
Peru, Ind.	15½	14
Port Huron, Mich.	19½	18
St. Clair, Mich.	19½	18
Sandusky, O.	18	17
South Bend, Ind.	15½	14½
Terre Haute, Ind.	14	13
Toledo, O.	17	16
Wabash, Ind.	15	14
Wauseon, O.	17	15½
Wolcottville, Ind.	16½	15
Youngstown, O.	20	18½

(1) Minimum weight (See Note 3).
(2) Minimum weight 60,000 lb.

27524. To cancel commodity rates on **crushed stone and screenings**, carloads, from Ellwood City, Rock Point and Chewton, Penn., to points in Pennsylvania on the B. R. & P. Ry. via B. & O. R. R., Butler, Penn., B. R. & P. Ry., as published in B. & O. R. R. (East) Tariff P. S. C. Penn. 2648, viz. (rates in cents per ton of 2000 lb.)

	From		
To B. R. & P. Ry. stas.	Ellwood City	Rock Point	Chewton
Johnsonburg, Penn.	150	150	150
Du Bois, Penn.	130	130	130
Sharon Clay Siding, Penn.	.....	130	130
Millikens, Penn.	130	.....	.....
Clearfield, Penn.	140	140	140
Sykes, Penn.	130	130	130
Punxsutawney, Penn.	120	120	120
McCulloughs Siding, Penn.	110	.....	.....
Smicksburg, Penn.	.....	110	110
Echo, Penn.	110	.....	110
West Mosgrove, Penn.	100	100	.....
Montgomeryville, Penn.	.....	.....	100
Laird, Penn.	.....	90	.....
Fenelton, Penn.	90	.....	.....
Lucasville, Penn.	.....	90	.....
East Butler, Penn.	.....	.....	90

27531. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) **and gravel**, carloads (See Note 3), from Winona Lake, Ind., to Avilla, Ind., rate of 75c per net ton. Present rate, $1.04 per net ton.

27532. To establish on (a) **limestone, agricultural, unburnt**, in bulk, in open-top cars; **stone, crushed**, in bulk, in open-top cars; **stone screenings**, in bulk, in open-top cars, in straight or mixed carloads, from Kenneth, Ind. (b) **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) **and gravel**, carloads (See Note 3), from Kenneth and Lake Ciecott, Ind., to Mexico, Collins, Churubusco and Moore, Ind., rates as shown below:

Crushed stone, from Kenneth, Ind.

To	Pres.	Prop.
Mexico, Ind.	65	65
Collins, Ind.	80	84
Churubusco, Ind.	80	84
Moore, Ind.	101	101

Sand and gravel from Kenneth and Lake Ciecott, Ind.

To	Pres.	Prop.
Mexico, Ind.	70	65
Collins, Ind.	84	84
Churubusco, Ind.	84	84
Moore, Ind.	105	101

27533. To establish on (a) **limestone, agricultural, unground**, in bulk, in open-top cars; **stone, crushed**, in bulk, in open-top cars; **stone screenings**, in bulk, in open-top cars, in straight or mixed carloads, from Kenneth, Ind. (b) **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) **and gravel**, carloads (See Note 3), from Kenneth and Lake Ciecott, Ind., to Pendleton, Ind., rate of $1.15 per net ton. Present rates, (a) $1.27 per net ton; (b) $2.90 per net ton (sixth class).

27535. To establish on (a) **limestone, agricultural, unburnt**, in bulk, in open-top cars; **stone, crushed**, in bulk, in open-top cars; **stone screenings**, in bulk, in open-top cars, in straight or mixed carloads, from Kenneth, Ind. (b) **Sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding and silica) **and gravel**, carloads (See Note 3), from Kenneth and Lake Ciecott, Ind., to Seafield, Ind., rate of 65c. Present rate, 70c per Penn. Tariffs 117A, I. C. C. F1918 and 125A, I. C. C. 135.

27537. To establish on **crushed stone**, carloads, when shipped in bulk, in open-top cars (See Note 3), from Greenfield, O., to Ohio points:

To	Prop.	To	Prop.
Oregonia	100	Spring Valley	90
Waynesville	95	Selma	80
Roxanna	95		

Route—Via South Charleston, O., and Penn. R. R. Present rates, class.

27538. To establish on **crushed gravel or lump fluorspar and calc spar** (calcite) **and fluorspar**, in bags, barrels, or in bulk, carloads, minimum weight 60,000 lb., from Evansville, Ind.

To	Prop.	*Pres.
Alton, Ill.	12½	18½
Gary, Ind.	15½	22½
Indiana Harbor, Ind.	15½	22½
East St. Louis, Ill.	13	18½
Peoria, Ill.	19	21½
St. Louis, Mo.	13	18½

*Sixth class.

27543. To establish on **agricultural lime**, carloads, minimum weight 30,000 lb., from Cold Springs, O., to points in Ohio:

To	Pres.	Prop.	To	Pres.	Prop.
Circleville	10	8	Dresden	11½	10½
Lancaster	10½	8½	Ellis	11½	10½
Bremen	10½	8½	Newark	10	8½
Jct. City	11	8½	Thurston	10	8½
New Lexington	11	8½	Newcomerstown	12½	11½
Crooksville	11½	8½	Uhrichsville	12½	12
Zanesville	11½	8½	Trinway	11½	10½
Coshocton	10½	8½	E. Liverpool	13	11½

27540. To establish on **agricultural lime**, carloads, minimum weight 30,000 lb., from Scioto, O., to points in Ohio, rates as shown below:

To	Pres.	Prop.	To	Pres.	Prop.
Bayard	15	11	Jeffersonville	12	9½
Cannelville	12	8½	Killbuck	12½	8
Carbondale	13	9½	Kingman	14	11½
Carrothers	11	7	Lordstown	16	11
Castalia	12½	7½	Maple Grove	12	7
Clara	13½	10	Middletown Jct.	12½	9
Dover	13½	11½	Mortimer	11	7½
Drakes	12	9½	New Pittsburgh	12½	10½
Falls Jct.	14	10	Sedalea	14	12
Galatea	11	7	Slater	10½	7½
Hamden	12½	9	Tontogany	12½	7½
Hamler	12	8			
Hobson	14	11			
Hopedale	15	12½			

27541. To establish on **fluxing stone**, carloads (See Note 3), from Keeport, Ind., to Youngstown, O., rate of $1.76 per gross ton. Present rate, classification basis (sixth class), 24c per 100 lb.

27567. To establish on **grinding sand**, carloads, loaded in open-top cars (See Note 3), from Butler, Penn., to Renfrew, Penn., rate of 60c per ton of 2000 lb. Present, no commodity rate. Rate of $1.17, Butler, Penn., to Pittsburgh, Penn., applicable under intermediate rules.

27593. To establish on **refuse material (burnt or refuse sand)**, carloads (See Note 3), from Sharon, Penn., to Cleveland, O., rate of 90c per ton of 2000 lb. Present rate, $1.25 per ton of 2000 lb.

27598. To amend Item 11640 of C. F. A. L. Tariff 218-G, naming rate of 31½c on **slag, slate, stone or gravel, crushed or ground** (See Note 3), except on gravel or stone, minimum weight not to be less than 72,000 lb., from Chicago, Ill., to New York, N. Y. (with usual differential relationship applicable to other points in Trunk Line and New England territories), to include **"granulated slag or granulated cinder."** Minimum weight same as applicable to crushed or ground slag. Present rate, 47½ (sixth class basis), minimum weight 50,000 lb. on granulated cinder and 40,000 lb. on granulated slag.

27599. To establish on **refuse blast sand dust**, carloads, minimum weight 80,000 lb., from Louisville, Ky., to East St. Louis, Ill., rate of 185c per net ton. Present rate, 23½c per 100 lb. (sixth class rate).

27603. To establish on **sand** (except beach, blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, lake, loam, molding or silica), carloads (See Note 3), from Tecumseh, Mich., to Lima, O., rate of 70c per ton of 2000 lb. Present rate, 80c per ton of 2000 lb.

27607. To establish on **burnt or refuse foundry sand**, carloads (See Note 3), from Kokomo, Ind., to Indianapolis, Ind., rate of $1.26 per net ton. Present rate, sixth class, 13c.

27633. To establish on **sand and gravel**, carloads (See Note 3), from Wapakoneta, O.

To	Prop.*	Pres.†
Converse O.	70c	11c
Elgin, O.	75	11½
Glenmore, O.	80	13½
Wren, O.	85	13½
Decatur, Ind.	90	13½

*Per net ton. †Per 100 lb.

27634. To establish on **sand and gravel**, carloads, in open-top equipment (See Note 3), from Massillon, O., to Apple Creek, O., rate of 60c per ton of 2000 lb., to expire six months from the effective date. Present rate, 70c per ton of 2000 lb.

27641. To establish on **gravel**, carloads (See Note 3), from East St. Louis, Ill., and St. Louis, Mo., to Cold Brook, N. B., only (See Note), rate of $9 per net ton.

Note: Rate named herein is a competitive rate and will not apply to intermediate points.

27648. To establish on **crushed stone**, carloads (See Note 3), from Greenfield, O., to Stoutsville, O., rate of 90c, and to Roseville, O., rate of 105c per ton of 2000 lb. Route—Via Washington C. H., O., and Penn. R. R. Present rate, 100c to Stoutsville, O., and 130c per ton of 2000 lb. to Roseville, O.

27649. To establish on **crushed stone**, carloads (See Note 3), from North Baltimore, O., to Emmett, O., rate of 85c per net ton. Route—Via B. & O. R. R., Defiance, O., Wabash Ry. beyond. Present rate, $2.60 per net ton (sixth class).

TRUNK LINE ASSOCIATION DOCKET

25656. **Roasted dolomite**, carloads (See Note 1), from Blue Bell, Penn. (P. R. R.), and Williams, Penn. (R. Co.)

To (P. R.R.)	Prop.	To (P. R.R.)	Prop.
Buffalo, N. Y.	252	Latrobe, Penn.	224
Baltimore, Md.	164	Brackenridge, Penn.	224
Trenton, N. J.	151	Butler, Penn.	252
Roebling, N. J.	151	Erie, Penn.	252
Kinkora, N. J.	151	Warren, O.	252
Harrisburg, Penn.	164	Midland, Penn.	252
Steelton, Penn.	164	Weirton, W. Va.	252
Burnham, Penn.	169	Wheeling, W. Va.	252
Johnstown, Penn.	224	Youngstown, O.	252
Pittsburgh, Penn.	224		

Proposed rates in cents per 2000 lb. Reason—Proposed rates are fairly comparable with rates from Bainbridge, Penn., to Claymont, Del., Marcus Hook, Penn., Johnstown, Penn., Buffalo, N. Y., Warren, O., Erie, Penn., etc.

25661. **Limestone, unburnt, ground**, carloads, minimum rate 60,000 lb., from Carmine, Va., to Englewood, Tenafly, N. J., $3.70, and to Yonkers, Tarrytown, Poughkeepsie, Albany, Troy, N. Y., $4.50 per net ton. Reason—Proposed rates are comparable with rates from Carmine, Va., to Bogota, N. J., and from Strasburg, Va., to Albany and Troy, N. Y.

25970. **Sand, blast, core, engine, fire, foundry, glass, molding, quartz, silex or silica**, carloads (See Note 2), from Hunker, Penn., to Crow's Nest Mine, Penn., 72c per net ton. (Present rate, 99c per net ton.) Reason—Proposed rate compares favorably with rate to Scottsdale and Greenburg, Penn.

25976. **Sand and gravel**, carloads, (a) loaded in open-top equipment; (b) loaded **in box cars or** other closed equipment (See Note 2), to Lansdowne to Media, Penn., inclusive, from South Jersey Group 1 points: (a) 1.75 and (b) $1.90 per net ton; from South Jersey Group 2 points, (a) $1.85 and (b) $2.10 per net ton, and from Pinewald, Quail Run and Toms River, N. J., (a) $1.80 and (b) $1.95 per net ton. Reason—Proposed rates are comparable with rates to Philadelphia, Penn., and Baltimore, Md.

25984. **Limestone, ground, precipitated or pulverized, and limestone dust**, carloads, minimum weight 60,000 lb., from Lime Crest, N. J., to Rutherford, N. J., 6c per 100 lb. Present rate, 7c per 100 lb., minimum weight 50,000 lb. Reason—To meet motor truck competition.

26000. **Fluxing stone**, carloads (See Note 2), from Richville, N. Y., to Dexter, N. Y., 95c per gross ton. (Present rate, $1.01 per gross ton.) Reason—To meet motor truck competition.

26013. **Crushed stone**, carloads (See Note 2), from Snow Flake, W. Va., to B. & O. R. R. Charleston Division stations, rates ranging from $1.40 to $1.80 per net ton. Reason: Proposed rates are comparable with rates from Lawton, Ky.

26016. **Sand**, in open-top cars, carloads (See Note 2), from Tatesville, Penn., to Bedford, Penn., 80c per net ton. (Present rate, $1 per net ton.) Reason: To meet motor truck competition.

26021. (a) **Sand, blast, engine, fire, foundry, glass, molding, quartz, silex and silica**, carloads; (b) **sand**, other than blast, engine, fire, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), from Kenvil, N. J., to Lee, Penn., (a)$1.53 and (b) $1.40 per net ton. Reason: To meet motor truck competition.

26029. **Gravel and sand**, N. O. I. B. N. in open cars, except blast, engine, foundry, glass, molding, quartz, silex and silica, carloads (See Note 2), from Black Rock, Buffalo, East Buffalo and Harriet, N. Y., to Depew and Lancaster, N. Y., 50c per net ton. (Present rate, 65c per net ton.) Reason: Proposed rate is comparable with rates on like commodities for like distances, services and conditions.

26031. **Sand, blast, engine, molding, foundry, glass, silica, quartz, silex or brick**, carloads (See Note 2), from Tatesville, Penn., to Kittanning, Penn., $2.10 per net ton. (Present rate, $2.61 per net ton.) Reason—Proposed rate is comparable with rate from Mapleton and Berkley Springs districts.

WESTERN TRUNK LINE DOCKET

1601-C. **Limestone**, carloads (See Note 2), but not less than 40,000 lb. per car, except that when cars of less than marked capacity are furnished for carrier's convenience, the minimum will be the marked capacity of car. When iron ore cars are furnished for carrier's convenience, actual weight will apply when cars are loaded to full visible capacity, from Inland Jct. and Blaney Jct., Mich., to Milwaukee, Wis. Present rates, 17½c per 100 lb.; proposed, 12c per 100 lb.

5322-D. **Lime**, phosphate of, minimum weight 50,000 lb., from Chicago, Joliet, Ill., and related territory, to Fremont, Neb. Present rates, 47c per 100 lb., fifth class; proposed, 38c.

1700-A. **Rock, gypsum**, from Chicago, Ill., originating beyond, to Ft. Dodge, Ia. Present rate, 20½c per 100 lb.; proposed, 11½c per 100 lb. Present minimum weight, 40,000 lb.; proposed, 60,000 lb.

2556-U. **Sand**, carloads (See Note 2), but not less than 40,000 lb., from Hager, Wis., to points in W. T. L. territory. Rates: Present, no commodity rates in effect; proposed, to establish the same commodity rates as are now published from Bay City, Wis.

6819-A. **Cement**, carloads, to Laramie, Wyo.

From	Pres.	Prop.
St. Louis, Mo.	54	33
Peoria, Ill.	56	35
Chicago, Ill.	57	36
Ft. Dodge, Ia.	51	33
Mason City, Ia.	52	35
Austin, Minn.	54	36
Des Moines, Ia.	51	33

2051-OO. **Stone, crushed**, carloads, from Luverne, Minn., to Clinton, Ia. Rates—Present, 12c per 100 lb.; proposed, 11c per 100 lb.

5645-B. **Cement, lime, plaster and stucco,** in mixed carloads, from Linwood, Mason City and Des Moines, Ia., to destinations in Nebraska. Rates—Present—Item 565A, W. T. L. Tariff 207 reads: "Apply on the cement, the carload rate at actual weight but not less than 50,000 lb.; and on the lime plaster and/or stucco, actual weight on each subject to the straight carload rate applicable to each." Proposed—To include in Item 105 of W. T. L. Tariff 133G, the state of Nebraska as destination territory, thereby establishing the following rule: "Apply on the cement, the carload cement rate at actual weight, but not less than 50,000 lb.; and on the lime, plaster and/or stucco, actual weight, a rate 23c per 100 lb. higher than the rate charged on the cement."

6289-B. **Sand,** carloads (See Note 2), but not less than 40,000 lb., from Nicols, Minn., to Chicago and Aurora, Ill., Bettendorf and Dubuque, Ia. Rates: Present, 12c per 100 lb. Proposed—9½c per 100 lb.

1468-W. **Cement bags,** used empty, returned, from W. T. L. territory, to Boettcher, Colo. Rates—Present, W. T. L. 133G, Sup. 5, Item 115A; proposed, cancel, allowing class rates authorized in I. C. C. 17000, part 2, if and when published, to apply.

7476. **Plaster board and plaster wallboard,** carloads, from producing points in W. T. L., C. F. A. and E. T. L. territories, to points in W. T. L. territory. Rates—Present, various; proposed, to establish rates based on 17½% of the Southwestern first class scale, which is similar to the basis prescribed under I. C. C. Docket 17006.

2292-H, Sup. 1. **Stone, crushed** (See Note 2), but not less than 40,000 lb.; when loaded in hopper bottom ore cars, 75,000 lb., from Randville, Mich., to Marseilles, Ill. Rates—Present, Class "E"; proposed, $2.70 per net ton.

7439. **Packing requirements—Lime,** in four-ply, multiple-wall paper bags, weighing not to exceed 50 lb. per bag, in less than carload quantities, between all points provided with less than carload rates on lime on Missouri intrastate traffic in the following tariffs:

Agent Boyd's 91F, P. S. C. Mo. No. 354.
Mo. Pac. 6708C, P. S. C. Mo. No. 1657.
Mo. Pac. 6172F, P. S. C. Mo. No. 1812.
St. L.-S. F. 3405C, P. S. C. Mo. No. 1023.
St. L.-S. F. 69L, P. S. C. Mo. No. 1033.

Rates—Present, not accepted for shipment; proposed to provide that the present less than carload commodity rates on lime will also apply on lime in four-ply, multiple-wall paper bags weighing not to exceed 50 lb.

7004-C. **Silica and flint,** carloads, from Tamms and Cox (Alexandria county), Ill., to Missouri river crossings, viz.: Kansas City, St. Joseph, Mo., Atchison, Leavenworth, Kan., Omaha, Neb. Rates to Kansas City and lower Missouri river points: Silica, present $5.11, proposed $2.70; flint, present $5.40, proposed $2.70. To Omaha, Neb., and upper Missouri river points: Silica, present $5.11, proposed $2.77; flint, present $5.50, proposed $2.77. Minimum weight, present, 40,000 lb.; proposed, 90% of the marked capacity of the car, except that when weight of shipment loaded to full visible capacity of the car is less than 90% of the marked capacity of the car the actual weight will apply. In no case shall the minimum weight be less than 40,000 lb.

7108-A. **Keene's cement,** minimum weight 60,000 lb., from Sigurd and Jumbo Mills, Utah, to "A" Mississippi river. Present rates, 50c per 100 lb.; proposed, 42½c per 100 lb. (Proportional rates to apply only on shipments destined to points east of Illinois-Indiana state line.) "B" Representative points:

	Pres.	Prop.
Baltimore, Md.	78½	68
Albany, N. Y.	81	70½
Boston, Mass.	84½	74
New York, N. Y.	82	71½
Quebec, Que.	92	80

5071-B. **Lime,** carloads, minimum weight 30,000 lb., same as Consolidated Classification, from Ash Grove, Mo., Galloway, Mo., Osceola, Mo., Pierce City, Mo., Springfield, Mo., Sequiota, Mo., Johnsons, Ark., to Selection, Ia., and Albia, Ia. Rates: Present—Class or combination rates. Proposed—From Ash Grove, Mo., Galloway, Mo., Osceola, Mo., Pierce City, Mo., Sequiota, Mo., Springfield, Mo., 17½c; from Johnsons, Ark., 19c.

7529. **Sand** (other than bank, glass, molding, silica, etc.), and/or sand bank, glass, molding, silica, etc., minimum weight, various, from, to and between points in Western Trunk Line territory. Description: Present — Various. Proposed — To amend all commodity descriptions on sand that now specify molding sand or are qualified to exclude molding sand, to make the same reference to core sand. The following definite commodity descriptions, exclusive and inclusive, are proposed: "Rates apply on sand, other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, molding or silica." Rates apply on sand, viz.: Blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, molding or silica.

7052-A. **Sand,** carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Kerrick, Minn., to Brillion, Wis. Present rate, 14½c; proposed, 12½ per 100 lb.

7531. **Sand and cement,** mixed, in bags, in straight carloads, minimum weight 40,000 lb., from Chicago, Ill., to Minneapolis, Minn., Milwaukee, Wis., Omaha, Neb., Kansas City, Mo.

	Pres.	Prop.
Minneapolis, Minn.	*27½	14
Milwaukee, Wis.	†	8½
Omaha, Neb.	*33½	16½
Kansas City, Mo.	*33½	16½

*Class "C" rate in accordance with Rule 10 of Western Classification.

†Class rates not applicable on sand via line of proponent carrier. Rate on cement is 10½c, and the Class "C" rate is 14½c to Milwaukee.

6289-C. **Sand,** carloads (See Note 3), but in no case shall the minimum weight be less than 40,000 lb., from Nicols, Minn., to Brillion, Wis. Present rate, 12c; proposed, 9½c per 100 lb.

3089-K. Minimum weight, **limestone, crushed or ground,** carloads, from White Bear, Mo., to points in Indiana, Michigan and Ohio shown in Item 1430-A of W. T. L. Tariff 58-N. Minimum weight, present, 40,000 lb.; proposed, 60,000 lb.

SOUTHWESTERN FREIGHT BUREAU DOCKET

22302. **Silica sand,** from Guion, Ark., to Henryetta, Okla. To establish a rate of 12c per 100 lb. on silica sand, carloads (See Note 2), from Guion, Ark., to Henryetta, Okla. In I. C. C. Docket 19443, the Interstate Commerce Commission required the application of the 9702 scale on this commodity from Guion, Ark., to Okmulgee and Sapulpa, Okla. Application of the 9702 scale will likewise produce a rate of 12c per 100 lb. from Guion, Ark., to Henryetta, Okla., distance 389.5 miles, figured via Missouri Pacific R. R., Aurora, Mo., St. L.-S. F. Ry., and shippers feel that the rate to Henryetta should be revised to the same basis as in effect to Okmulgee and Sapulpa, with which points Henryetta is in direct competition. Shippers are also fully aware that with the forthcoming revision in I. C. C. Docket 17000, part 11, the basis to Henryetta as well as Okmuigee and other points, will be revised, and are seeking 12c rate to be effective only so long as like rate is maintained to other Oklahoma destinations mentioned above.

22332. **Agricultural limestone,** from Mosher, Mo., to Illinois points. To establish a rate of 85c per ton of 2000 lb. on agricultural limestone, crushed or ground, carloads, in open-top cars, minimum weight 10% less than marked capacity of car, but not less than 40,000 lb., from Mosher, Mo., to Dupo, Valley Junction and Vulcan, Ill. (to apply as a proportional rate on traffic destined to points beyond). At the present time there are no through rates on agricultural limestone from Mosher, Mo., to points on the Missouri Pacific R. R. and connections leading out of East St. Louis, such as Penn. R. R., C. & A. R. R., etc., and due to the fact that the rates on sand, gravel and stone, also on chatt, from Missouri producing points to stations in Illinois are now involved in various complaints filed before the Illinois C. C. and I. C. C., proponent is not arranging for through rates but is suggesting proportional rate to be used as temporary basis until a decision is rendered.

ILLINOIS FREIGHT ASSOCIATION DOCKET

1257. **Silica sand,** washed or processed, carloads (See Note 3), but not less than 40,000 lb., from Ottawa, Ill., to Jackson, Miss. Present rate, $4.60; proposed, $3.85 per net ton.

3950. **Sand, silica, washed or processed,** carloads, from Millington, Oregon, Ottawa, Sheridan and Utica and Wedron, Ill., to destinations in Alabama, Georgia and Tennessee. Rates per net ton. (To representative points.)

	Pres.	Prop.
Anniston, Ala.	$4.40	$4.40
Columbus, Ga.	4.65	4.55
Franklin, Tenn.	3.70	3.70
Marietta, Ga.	4.50	4.40
Rome, Ga.	4.50	4.30

1774-A. **Sand and gravel,** carloads (See Note 1), from Grayville, Ill., to Mt. Carmel, Ill. Present rate, combination; proposed, 80c per ton.

4681-D. **Lime,** straight carloads, to Keokuk, Ia.

From	Pres.	Prop.	Min. wt.
Mosher, Mo.	17	.....	40,000 lb.
Ste. Genevieve, Mo.	16	13½	60,000 lb.

1630. Agent B. T. Jones' Freight Tariff 420D, I. C. C. 2303, publishes rate of 85c per ton of 2000 lb. on **sand, gravel,** etc., from Munger, Ill., on the E. J. & E. Ry., to Chicago, Ill. Proposal to provide for the same restriction in connection with this movement via the C. & E. I. Ry. as is now carried from Joliet and other E. J. & E. Ry. stations by circle reference 77.

4883-D. **Sand, blast, engine, foundry, glass and molding** (See Note 1), from Bowes, Ill., to Geneva, Batavia and Carpentersville, Ill. Present rate, $1.39; proposed, $1.25 per net ton.

5984. **Sand,** carloads, other than glass, silica or molding, from Milwaukee, Wis., to Litchfield, Ill. Rates per net ton—Present, $2.50; proposed, $2.10.

5991. **Sand and gravel,** carloads, from Milwaukee, Wis., to Paris, Ill. Rates per net ton—Present, $2.50; proposed, $2.30.

3339. **Stone, crushed, coated with oil, tar** or **asphaltum** (known as amiesite or carbo rock), carloads, from Peoria, Ill., to all destinations in I. R. C. territory. Note: Rates shown herein may be used only when no specific through commodity rates from and to the same points. When governed by classification which also contains distance or mileage commodity rates they will take precedence over distance or mileage commodity rates in such classification. They may not be used either by themselves or in combination in preference to any specific commodity rate. Class rates for distances of:

	Prop.
25 miles and under	96
40 miles and over 25	107
60 miles and over 40	119
75 miles and over 60	130
100 miles and over 75	142
125 miles and over 100	153
150 miles and over 125	176
175 miles and over 150	188
200 miles and over 175	199
225 miles and over 200	211
250 miles and over 225	222
275 miles and over 250	234
300 miles and over 275	257
325 miles and over 300	268
350 miles and over 325	280
375 miles and over 350	291
400 miles and over 375	303

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

21551. (a) **Blocks,** building, plaster; **plaster,** calcined, land or wall; (b) **plaster board;** (a) **lime,** hydrated, in straight or mixed carloads, minimum weight 40,000 lb., from Boston, Mass. (ex B. & M. R. R.), to New London, Conn. Present—(a) 15½c, (b) 14c, plus $5 per car. Proposed—(a) 15½c, (b) 14c (to apply on shipments received from B. & M. R. R. originating at stations within the Boston switching limits and includes switching charges of the B. & M. R. R. at Boston, Mass., as per tariffs lawfully on file with the Interstate Commerce Commission or the Massachusetts Department of Public Utilities.) Reason—Necessary to meet that in effect via competing route.

21435. **Phosphate rock,** ground or pulverized, acidulated (super-phosphate [acid phosphate]), minimum weight 60,000 lb., from Lowell, Mass., to various points on the N. Y. N. H. & H. and M. V. railroads, representative points shown below:

To	Pres.	Prop.
Amston, Conn.	17	13½
East Wallingford, Conn.	17½	15
Hartford, Conn.	17	15
New Haven, Conn.	17½	15½
Wallingford, Conn.	17½	15½

Reason—To meet motor truck competition and also competition arising because of the location of other plants producing this material who receive their raw materials by water.

21449. **Molding sand** (See Note 3), from Elnora, Mechanicville, Reynolds, Schaghticoke, Schuylerville, Scotia, Saratoga Springs, Stillwater, Wayville and Ushers, N. Y., to Smiths Falls, Ont. Present, 18c; proposed, 16c. Reason—To establish a rate from B. & M. R. R. sand shipping points in the Albany district comparable with those now published from points in that district on the lines of competing carriers.

21831. To cancel commodity rate of 16c on **lime and limestone** from Rockland, Thomaston and Warren, Me., to Que. C. Ry. stations as named in Items 75 and 80 of Me. C. R. R., I. C. C. C4272, and apply in lieu thereof combination. Reason—Obsolete rates.

I. C. C. Decisions

17854. Cement. In a report written by Commissioner Porter in No. 17854, Iola Cement Mills Traffic Association et al. vs. A. T. & S. F. et al., and the cases joined with it, the commission, by division 3, has made findings which will require a considerable revision of rates on cement from mills in Kansas to Missouri and within the latter state. Missouri cement rates are found to give an undue preference to Missouri mills to the disadvantage of competing Kansas mills. The cases joined with the title complaint are a sub-number, Fredonia Portland Cement Co. (of Delaware) vs. A. T. & S. F.; No. 18299, Kansas Portland Cement Co. vs. Same, and No. 18264, Lehigh Portland Cement Co. vs. Same. No order was issued in connection with the report.

Reparation was denied, the findings of unreasonableness having been confined to the

future and the evidence as to damage on account of third section findings not being deemed of a character to warrant an award.

The proceeding was in the nature of an appendix to Western Cement Rates, 48 I. C. C. 201, in which the commission prescribed scales for use within territories limited and named by it, the terminology in this case relating to territories being that used in the Western case. As to the nature and scope of the proceeding, Commissioner Porter said:

"Considered collectively the cases bring in issue under section 1 the interstate rates to all destinations in Missouri from Iola and Bonner Springs, Kan., and from Chanute, Humboldt, Mildred, Fredonia, Independence and Dewey to destinations in southern Missouri. The reasonableness of the intrastate rates from Sugar Creek and Prospect Hill to all destinations is in issue in the complaint before the state commission. The combined cases also bring in issue the relationship as between the interstate rates from Bonner Springs and Iola to all destinations except those on and east of a line hereinafter mentioned, and from the named points in the gas belt to southern Missouri, on the one hand, and the intrastate and interstate rates from producing points in Missouri to the same territory of destination. The one exception to the section 3 allegation in the interstate complaints is the agreement of all parties to exclude the territory in extreme eastern Missouri along the Mississippi river. There is, of course, much conflict of interest among the various complainants, but all of them, as well as defendants, agree that a uniform basis of rates should be prescribed for application interstate and intrastate from all producing points. Complainants contend for the state-wide application of cement scale II, whereas defendants take the position that no scale lower than scale III should apply in southern Missouri."

Findings were made throughout the report, but Commissioner Porter also summarized them in disposing of the case as follows:

"(1) We find that the present grouping of Kansas gas belt mills in respect of traffic to destinations in Missouri has not been shown to be in violation of sections 1 or 3 of the act.

"(2) We further find that the rates published in Agent Boyd's tariffs, I. C. C. Nos. A-1343 and A-1676, for application from mills in the Kansas gas belt to Clinton, Ill., and St. Louis, Mo., are not applicable at destinations in southern Missouri, as contended.

"(3) We further find that the present interstate rates on cement, in carloads, from Iola and Bonner Springs, Kan., to destinations in scale II territory are not unreasonable. We further find that the interstate rates on cement from those points and from Chanute, Humboldt, Mildred, Independence and Fredonia, Kan., and Dewey, Okla., to destinations in the present scale III territory in Missouri which lie south of a line following the line of the Frisco from St. Louis to Pacific, Mo., thence the line of the Missouri Pacific to Labadie, Mo., and thence the line of the Rock Island to Kansas City, Mo., are not unreasonable, but that the rates from those points of origin to destinations in the present scale III territory which lie on or north of said line are, and for the future will be unreasonable to the extent that they exceed or may exceed rates based upon cement scale II as set forth in Western Cement Rates, 69 I. C. C. 644, on page 658, under distances computed as at present at points of origin and destinations, plus existing arbitraries for short and weak lines, which rates we prescribe as reasonable maxima.

"We further find that the rates on cement from Fredonia, Humboldt and Mildred to destinations in scale III territory were not unreasonable in the past.

"We further find that the rates on that commodity from Fredonia, Humboldt and Mildred to destinations in no-scale territory were not unreasonable in the past, but that the rates on cement from Iola, Chanute, Humboldt, Mildred, Fredonia, Independence and Bonner Springs, Kan., and Dewey, Okla., to destinations in no-scale territory in Missouri are, and for the future will be unreasonable to the extent that they exceed, or may exceed rates based upon cement scale III as set forth in Iola Cement Mills Traffic Association vs. A. W. Ry. Co., 87 I. C. C. 451, at page 466, under distances computed as at present at points of origin and destination, plus existing arbitraries for short and weak lines, which rates we prescribe as reasonable maxima.

"(4) We further find that the circumstances and conditions surrounding the transportation of cement, in carloads, from Iola and Bonner Springs, Kan., to all destinations in Missouri west of the line of the St. Louis and Hannibal from Hannibal to Gilmore, thence the Wabash to St. Louis, thence the Frisco to Horine, thence the Missouri Pacific to Delta, thence the Frisco to Cape Girardeau and from Chanute, Humboldt, Mildred, Independence and Fredonia, Kan., and Dewey, Okla., to destinations in scale III and no-scale territories, as here defined and bounded on the east by the line just described, are substantially the same as those arising in respect of such traffic from mills located within the state of Missouri; that there is competition between mills without, complainants and interveners herein, and mills within the state of Missouri, in the sale of cement in that state; that the rates herein prescribed for interstate application to destinations in Missouri are and will be maximum reasonable rates; that the intrastate rates, to the extent that they are lower, distance considered, or on lower and different levels, distance considered, to the same portion or portions of the state, as herein defined and limited, result and will result in undue preference and advantage of shippers in intrastate commerce and in undue prejudice and disadvantage to complaining shippers in interstate commerce; and that said undue preference and prejudice can and should be removed by the establishment and maintenance within Missouri of the bases of rates herein prescribed for interstate application.

"(5) Reparation as prayed in No. 17854 (Sub.-No. 1) is denied.

"Although all of the gas-belt mills are not complainants in respect of the rates to all destinations, it is assumed that the carriers, in making the readjustment herein prescribed will preserve the rate parity now obtaining among the mills in that group. In view of the fact that the basis of rates herein prescribed for application to the so-called no-scale territory will dovetail into the state adjustment which will also be established as a result of this proceeding we will enter no order at this time. We will leave to the state commission and the carriers the matter of adjusting intrastate rates which will harmonize with the interstate rates herein approved or prescribed. If such readjustments are not effected within a reasonable time the interested parties may bring the matter to our further attention.

"The establishment of scale III rates to destinations in southern Missouri may result in rates to intermediate points higher than rates to destinations in Illinois. No fourth-section relief will be granted at this time and in order to comply with the long-and-short-haul clause of that section defendants will be permitted to hold the border-point rates as maxima at more distant points in the lower-rated territory.

"The matter of arbitraries for short and weak lines should be worked out by the carriers, including these short and weak lines, in readjusting the rates."

Louisiana Sand and Gravel Rates

FRANCIS WILLIAMS, chairman of the Louisiana Public Service Commission, has written to Chairman Brainerd of the Federal Commission, suggesting, in view of the decision of the Supreme Court in the Florida log case, a reopening and amendment of the Louisiana part of No. 17000, part 11, Hoch-Smith sand and gravel, 155 I. C. C. 247, so as to take it out of the Supreme Court of the United States. It is now pending there on appeal from the three-judge court, sitting at New Orleans, La., which sustained the order of the Commission. The case in the Supreme Court is No. 202, State of Louisiana et al. vs. United States et al. Receipt of the letter has been acknowledged but no other action has been taken. In part, Mr. Williams said:

"Our Louisiana sand and gravel case is now in the United States Supreme Court on an appeal taken by us from the decision of the three-judge district court at New Orleans. It has cost and is now costing and will cost the State of Louisiana and your commission considerable money for its prosecution to a final decision.

"I am wondering if, in view of the decision of the Supreme Court in the Florida case which indisputably was a weaker case for state commission control of state rates, you will not be willing to take up with your colleagues the proposition of reopening the Louisiana cases so as to make it possible for us to file a petition which would have the effect of limiting the scope of your order to the territory in north Louisiana described in your order and our order following our joint findings of actual discrimination against Arkansas shippers in said territory."—*The Traffic World.*

Georgia Sand and Gravel Case Taken to Supreme Court

THE SUPREME COURT of the United States, on January 19, noted that probable jurisdiction had been shown in No. 555, Georgia Public Service Commission et al. vs. United States et al., with which is consolidated State Highway Board of Georgia et al. vs. United States et al., and will review that consolidated case on appeal from a three-judge court in Georgia. The case relates to rates on chert, sand and gravel in Georgia ordered by the Commission in Rates on Chert, Sand and Gravel in the State of Georgia, I. C. C. 309.

Georgia authorities sought to enjoin and set aside orders of the Commission and to enjoin the railroads from filing and making effective any tariffs in accordance with the orders. The court denied the application and Georgia took an appeal to the Supreme Court, which has now been perfected through the court's noting of probable jurisdiction.—*The Traffic World.*

Southeastern Mills Hold Best Safety Meeting

Fifth Annual Conference at Birmingham "Bigger and Better"

WHEN R. H. MacFetridge rapped for order at the opening session of the fifth annual safety meeting of the southeastern cement mills at Birmingham, Ala., on Tuesday, January 27, he was confronted with one of the largest convocations of cement mill operators ever assembled outside the Lehigh Valley.

"Fellow cement makers and dust slingers," said he, employing the titles by which attendants at this annual function are commonly addressed, "we are assembled here today to put an end to all remaining accident hazards and risks. Woe betide the delegation that fails this morning to contribute its best safety ideas into our common fund. You will have a few minutes to assemble your ideas while Mr. Curtis of the Cement Association reports on how we came out for 1930."

After referring to current safety progress in the industry, Mr. Curtis said:

"The object of this meeting may be illustrated simply by an adaptation of an old Chinese story. A certain man, running across the first looking glass, peeped in and recognizing the likeness of his favorite grandfather bought the glass. He carried it home surreptitiously, intending to bring it out for display on some sufficiently important occasion, with a setting befitting his most unusual discovery. But the keen eye of his wife discovered the package and she opened it and gazed.

"Returning to her husband she demanded that he remove at once the picture of his frowzy friend. The ensuing battle brought in the family. Each looked and added to the general bewilderment. Of course each saw only the reflection of what was before this mirror. Our opportunity here today is to put our own pictures all together, affording each one a composite view and a better perspective on our common safety problems."

Ideas for Improving Plant Safety Work

The interchange of ideas was then put on under the skillful guidance of Chairman MacFetridge. It exhausted the time allotted for the morning session and cut in on the noon hour. Men talked freely, interestingly and knowingly, confident that they were helping their mills to make new history. The following are a few of the many valuable safety ideas contributed at this session:

H. O. Underhill (Alpha): Company's cash award plan has helped noticeably to keep up interest during the few months since it was introduced at the Birmingham plant. Present condition of the labor market makes this an unusually favorable time to tighten up on careless practices and to talk to men about safety with the prospect that even very careless men will listen.

R. H. MacFetridge, superintendent of Birmingham, Ala., plant, Lehigh Portland Cement Co.

L. B. Reifsneider (Cumberland): First-aid training, conducted at our plant by the United States Bureau of Mines, had more to do than any other one factor in the greatly improved safety record in 1930. Noticed good results always follow when executives and supervisors impress safety on the men in a friendly way.

G. A. Collins (Lehigh, Birmingham): The grounding of portable electric quarry equipment is probably the most effective new safety idea at our plant. This is done by using a 4-wire cable, one being a grounded conductor. Groundometers have been installed and grounds on permanently installed equipment are being tested frequently.

W. M. Cabaniss (Lone Star, Birmingham): Plant has recently established a small monthly paper devoted to safety which is very much desired by the men, as any delay in publication or failure in distribution brings lively inquiries or protests. This plant also finds benefit from a revived interest in bulletin boards.

W. W. Deadman (Lone Star, Spocari, Ala.): Finds that to retain a perfect safety record is much harder than to attain one. Plant organization has a committee working out its safety strategy and holds a mass meeting once a month. Company's bonus plan, which awards employes of a safe department, $10 each for the first perfect year, $20 for the second year and so on up to $50 for the fifth year, has been of tremendous help and he has frequently come upon the colored workmen discussing these payments very earnestly.

I. C. Brotzman (Lone Star, New Orleans): Felt that the results of good housekeeping were outstanding in all plant safety work and recommended continual attention to this factor.

W. P. Reno (Lone Star, New Orleans): Probably the most helpful safety idea at our mill is the monthly mass meeting. At succeeding meetings we have heard our general superintendent, superintendent and many of the leading bankers, lawyers, doctors and public leaders declare for safety above everything else.

J. G. McVay (Lone Star, St. Stephens, Ala.): Hammer mill operator has been provided with a shield through which he can safely watch the operators of the crusher. This consists of two heavy frames, one containing a strong screen and the other a heavy glass. Upkeep of our machine tools is being given considerable attention at present. This will do away with a prolific source of accidents both minor and serious.

R. E. Nicholson (National, Ragland, Ala.): A kangaroo court tries all men guilty of infractions of safety rules, so far as they can be found. The accused secures counsel, of which he is usually in real need. The judge may sentence a guilty man to a layoff or a disagreeable task to be performed on his own time. Dismissal may follow failure to obey the sentence.

R. R. Webb (National, Ragland, Ala): Our safety work never stops. It is perpetual and that is why it gets results. In 1925 we had 126 lost-time accidents and two fatalities. In 1930 we had only four slight lost-time accidents.

N. N. Geyer (Penn-Dixie Cement Corp., Kingsport, Tenn.:) At our mill the superintendent goes through every day talking to each man about his safety and pointing out to him any special hazards noticed. He also talks with the men frequently regarding personal causes for getting hurt by taking the mind off the job.

G. W. Rhoads (Penn-Dixie Cement Corp., Clinchfield, Ga.): Our suggestion to accumulate interest is to divide the organization into safety contest teams, each contest to run six months. The losing team then pays for a barbecue. If all are free from accident, the company buys the barbecue. At the end of our first contest we ate "on

the company." We expect to do so again soon.

A. E. Legg (Penn-Dixie Cement Corp., Richard City, Tenn.): In selecting statistics on accidents for use on bulletin boards, don't make them complicated, obscure or cumbersome. It is the simple and obvious facts that convince men.

J. F. Ullman (Penn-Dixie Cement Corp., Richard City, Tenn.): Study has shown that a year is too long to hold interest in a single safety stunt or project. Recommended that four to six months is a more practical period. Richard City plant is successfully using a safety contest board in which traveling figures, representing men carrying safety banners, symbolize the various departments. At the end of the travel of each figure is another bearing a broad smile and extending a hand, ready to congratulate the winner.

W. E. Keenen (Penn-Dixie Cement Corp., Richard City, Tenn.): Don't put newly hired men on hazardous jobs. Advance to such jobs men of experience with your methods, regulations and dangers. Place the green men where they will be protected by the experience of others until they have acquired this quality in themselves.

R. C. Lee (Universal Atlas, Leeds, Ala.): We do not allow more than one or two cases of powder in the quarry at any time. The powder is carried in, a box at a time, in a leather sack. Powder boxes in the quarry are placed in bright red wooden containers.

W. N. McBivus (Universal Atlas, Leeds, Ala.): One of our rules which we rigidly enforce requires the wearing of goggles wherever the nature of the work makes this a sensible precaution. We have furnished every employe with a set of safety rules, including special rules applying to his particular department. These rules are read and discussed with new men and hazards in their new surroundings are shown and explained to them.

Lehigh first-aid team

G. W. Moore (Volunteer, Knoxville, Tenn.): Motion pictures of accident subjects are usually helpful, as they impress on the mind the unpleasant features of the accidents. Likewise, first-aid training very greatly impresses men with the thought that they don't want to be the unhappy subject of such treatment.

W. E. North (Volunteer, Knoxville, Tenn.): Our quarry is a hazardous one, leading us to believe that a great deal of good work can be done by concentrating a little more on quarry safety.

P. J. Prewitt (Birmingham Safety Council): Publicity is one of the most forceful weapons with which to attack accidents. Publicity makes people think about it but you must be continually changing the angle or viewpoint to keep readers interested.

Lt. Col. H. A. Reninger (Lehigh, Allentown, Penn.): Nothing is more valuable than to point to good safety examples. When a mill makes a good safety record it provides a mark for all the others to struggle for.

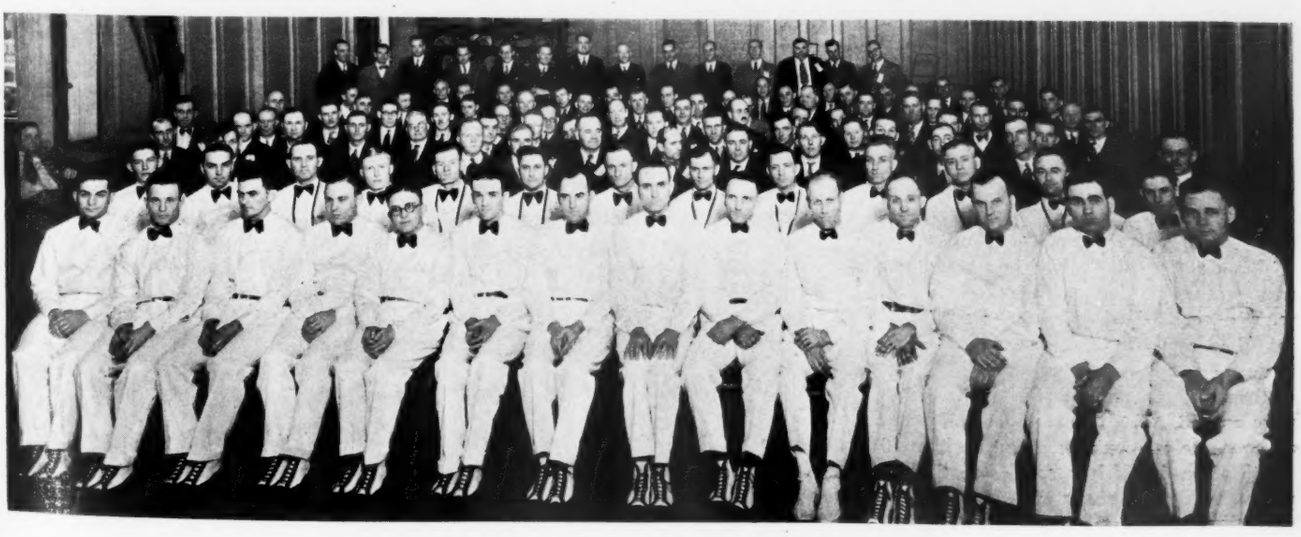
A. J. R. Curtis (Portland Cement Association): Make out accident reports with the utmost thoroughness and study them exhaustively. If an accident has any salvage value it is in providing effective warning to the many men similarly exposed.

T. G. Brabson (Birmingham Electric Co.): Tell your men a good safety story once in a while, one they can laugh at and see the point without the aid of an eyeglass. A happy and contented spirit makes for safety.

Luncheon Session

The large private dining room at the Tutwiler was packed to capacity and a second table had to be set to accommodate the luncheon crowd. H. O. Underhill, manager of the Birmingham plant of the Alpha Portland Cement Co., presided. John H. Taylor, commissioner of public safety of the city of Birmingham; F. B. Winslow, president of the Birmingham Safety Council, and Dr. James E. Bathurst of Birmingham Southern College were guests and speakers.

Dr. Bathurst gave a particularly valuable talk. He said that as to cause, accidents may be classified into three categories. The first are those which are caused by lack of safety devices and by the natural hazards of the job, such as flying cinders, smoke, dirt and the like. This kind of accidents is called mechanical. Secondly, regulations and lack of information concerning safety practices and procedures. This kind of accidents is called educational. Third, those accidents which result from lack of innate or inherited qualifications or traits. This kind of accidents is called innate, and does not necessarily imply lack of skill which may be acquired but may be thought of as deficiencies at birth.



Regional safety meeting, Birmingham, Ala., January 27

According to reliable statistics, Dr. Bathurst said that about 10% of accidents are mechanical as to cause, while 90% are educational and innate. There are no reliable statistics as to the percentage which are innate, but it has been estimated that about 45% are educational and 45% innate. It was to this latter class of accidents that the speaker devoted most of his time, and the following paragraphs give the high lights of his talk:

Dr. James E. Bathurst

"In the first place, and fundamental," said Dr. Barthurst, "men are not created equal. We are all born with varying amounts of abilities, traits and aptitudes. Now some of these traits and aptitudes cannot be improved by any known method of training or education. They also are not observable to the ordinary person. They crop out though when a man is at work which may make him an accident hazard. The most outstanding of these traits are as follows: muscular co-ordination, abstract intelligence and reaction time.

"By reaction time is meant the time which it takes a person to move after a stimulus has been applied. The reaction time, for example, to a hot stove would be the time which it takes a person to jerk his finger from the hot stove after his finger touches the stove. Persons differ in the time it takes them to react or move. The reaction time for some persons is as low as 3/10 sec., while for others it is as high as 1½ sec. It might appear at first that this difference would be so insignificant as to be valueless. An illustration will show the contrary. An experiment was made as to the reaction time of drivers of automobiles and the effect the reaction time had upon the time it took to stop a car going at a certain speed. In the experiment a car was speeded up to 30 miles an hour. The driver was told that when the revolver was fired, he was immediately to put his foot on the brake and stop the car. The reaction time of one of these drivers was ½ sec., which meant that the car covered a distance of 22 ft. while the driver was getting his foot on the brake. The reaction time of a second driver was 1½ sec. The car covered a distance of 66 ft. while the second driver was getting his foot on the brake. Assuming that after the brakes were applied, going at the rate of 30 miles an hour, the car could be stopped within 50 ft., then the first driver could stop the car within a distance of 50 plus 22 or 72 ft. after the signal to stop was given. The second driver would stop the same car after the signal was given within the distance of 50 plus 66 ft. or 116 ft. This difference in driving down a busy city thoroughfare is the difference between clearance and a severe accident.

"Reaction time is an innate or inherited trait and hence cannot be changed appreciably by training, education, or experiences. Slow reaction, then, is undoubtedly a fruitful source of accidents not only in automobile traffic, but also in industrial concerns due to the fact that some workers move so slowly as to make them unable to avoid machinery and moving objects and also causes decreased skill due to inability to move fast enough.

"The other innate traits mentioned above act the same way as reaction time. It is difficult for some of us to realize that some people are born with some traits that cannot be changed by any known method of training, or education, but this is a fact that has been so thoroughly proven that it seems futile to question it.

"Safety programs of the future will, therefore, include two procedures in addition to the methods now being used. First, the innate qualifications of the employes will be determined; and the characteristics of the job, in regard to these innate qualifications will also be determined, and the proper men will be placed in the proper job. This procedure we term as adjustment in service. The second procedure will be that of eliminating all applicants for jobs who do not have proper innate qualifications. When this is done the adjusting in service will decrease, accidents will also decrease, and general working efficiency will increase. Thus these two procedures would be justified not only on the basis of a decreased number of accidents but also increased working efficiency."

Afternoon Session

A. E. Legg, superintendent, Pennsylvania-Dixie Cement Corp., Richard City, Tenn., presided during the afternoon. The program consisted of a series of papers which are here summarized.

R. C. Crumbaugh, technical representative, E. I. DuPont deNemours & Co., spoke on "Safe Handling and Use of High Explosives."

"The first opportunity that dynamite has of becoming a hazard begins," he said, "with the arrival of a carload shipment on the operator's own railroad siding or with the transfer of the explosives into his possession from the manufacturer's truck."

Mr. Crumbaugh enumerated a number of hazards in the use of explosives, but confined himself principally to the loading of well-drill bore holes, which he considered the most important from the standpoints of both safety and efficiency. He said:

"If I were asked the most important step necessary to prevent accidents in loading well drill holes, I should say: Organization of the loading crew. The assignment of too many men to a loading crew not only increases the hazard but actually retards the efficiency of the work. An ideal crew to each hole is four men—one man to open the cases of dynamite; the second man to take the cartridges, slit and drop in the bore hole; the third to handle the tamping block, and the fourth should keep the empty cases filled with stemming and placed by the bore hole being loaded. It is hazardous for the man directing the loading to take actual part in the labor of loading.

"It is to the company's interest to have an accurate loading chart of each shot, recorded information on spacing, burden, depth and tonnage on each hole to be shot, together with any information that may be of advantage to note, such as mud seams, slips, caves, et cetera. In order for the man directing the loading to keep a proper loading chart, some thought should be given to the most satisfactory method of recording information, in order for it to be of future use. Personally, I prefer to keep a log of the holes loaded. To keep this information, it is necessary for the tamping rope to be marked off in 10-ft. intervals. This is done by simply spreading the rope and securely tying a heavy twine through and around the rope at the intervals. It should be the duty of the man running the tamping block to count the markers as they go into the hole. By doing this, an accurate check can be kept on the manner in which the powder is building up in the bore hole without wasting any time. At any time the man keeping the log can get the necessary information. The block should be lowered into the hole the very first thing, before any attempt is made to load any powder into the hole. This will give an opportunity to check the depth, and see if the hole is clear before any powder is lowered. My logs are kept with depth at various points on the right, and pounds

Penn.-Dixie first-aid team

of dynamite on the left, between the depth notations. The kind of dynamite is represented by a symbol. This makes a very convenient method of seeing that a hole is not blocked in the progress of loading. At the same time, it makes it possible for one man to supervise three or four loading crews with ease. If something did happen to the hole, and it failed to fire, definite information as to exact depth of stemming to the dynamite is available. From a safety standpoint the loading log is even more valuable than its use to gain efficiency in shooting.

R. C. Crumbaugh

"Sometimes the cost item is carried to too fine a point. For instance, an operator using countered cordeau in a deep, rough, well-drill hole, instead of double-countered, would realize a saving of only $2 on 1000 ft. of cordeau, or 20c on a hole 100 ft. deep, whereas the drilling and explosive cost would probably be $200 or more. Of course double countered cordeau is much stronger, will stand more tamping, and is much safer to use in deep well drill holes. This reduces the hazard of a partially missed hole, and the safety advantage more than offsets the slight increase in cost.

"Another item that is usually overlooked, and which to my mind is of utmost importance in loading, is proper stemming material. Sand or screenings makes ideal stemming and can be easily handled in wet weather. By using either of these, holes can be stemmed and tamped with little chance of getting rock in the bore hole, that might cut the cordeau in tamping."

J. H. Honeycutt, general foreman, Lone Star Cement Co., Alabama, Spocari plant, gave a paper on "Accidents Involving Powdered Coal." The following are extracts quoting conclusions from Mr. Honeycutt's paper:

"In order to eliminate the dangers commonly attributed to powdered coal, we must inform ourselves as to the proper method of handling it.

"With the exception of accumulated dust explosions, which are directly chargeable to the modern unpardonable sin of poor housekeeping conditions, any accident resulting from the use of powdered coal can be attributed to the improper operation of the crushing, feeding, grinding, igniting or other auxiliary operations.

"Powdered coal dust when suspended in the air will burn like a gas and if confined it will explode like a gas. For this reason, great care should be exercised in keeping plants using pulverized coal as clean as possible. Coal dust collects on walls, beams and similar places. Should there be a small explosion in some part of the plant, the concussion of the explosion would start this coal dust to fall and, being held in suspension in the air, the whole plant would be immediately swept by flames.

"In plants using systems whereby the coal dust is stored in quantities, great care should be observed in the use of extension lamps, especially when lowering them into coal hoppers, as a short circuit or a broken lamp globe would cause an arc, which, given the right conditions, would cause an explosion."

"Proper Training of the New Employe"

The above subject was discussed by **S. L. Brannon,** shift foreman, Pennsylvania-Dixie Cement Corp., Richard City, Tenn. He said that unless given proper training immediately after being placed on the payroll, the new employe is a potential hazard both as regards causing an injury to himself or being responsible for accidents to his fellow employes. Many serious accidents are caused by lack of proper care and discrimination in the selection of employes. Others are due to failure to issue proper instructions to new men and lack of subsequent training and supervision. The effectiveness of accident prevention work is, therefore, dependent upon the selection, instruction, training and supervision of employes. He gave the following suggestions for improved practice in dealing with new employes:

"Studied attention to accidents in the cement business brings out the fact that certain jobs require particular care in the selection of personnel because of the greater responsibility for, or likelihood of, accidents. References and previous experience, character, physical fitness and general intelligence are some points which should always be considered in the selection of new employes.

"Good character is the first essential in the proper selection of new men. Without this important qualification, no applicant should be considered for a permanent place in the organization, regardless of how high his other qualifications may be. It is just as important to employ honest men in the cement business as it is to employ honest men for positions of trust in a bank.

"Explanation of company policies, introduction to work, rules which apply to his work, and accident hazards are some important points to be covered in the instruction and training of the new employe.

"After company policies have been explained to the new man, he should be told what is expected of him in the way of loyalty to the company, co-operation with fellow employes, treatment of the public and obedience to rules and orders. The manager or supervisor can render a valuable service to his company by spending a half hour or more with the new employe, giving him a proper conception of the company and a thorough understanding of his duties and responsibilities.

"He should then be sent to the safety director, who should acquaint him in detail with the safety organization, plans for accident prevention work and the most important rules. Care should be taken to properly impress him with his personal interest and responsibility. He should also understand his responsibility for the safety of his fellow employes and the protection of the public. Much of his future co-operation in accident prevention will depend upon his understanding of these responsibilities and his understanding of the safety director's interest in him. In some cases it has been found beneficial for the safety director to further talk with the new man after his breaking-in period, with a view towards checking up on his understanding of safety rules and responsibilities.

"When the new employe is ready for work he should be introduced to the person in charge of his department, and to the men with whom he is to work, who should welcome him into the organization. He should be made to feel that he has become a part of a desirable organization—one which appreciates the product of his mind as well as of his hands.

"All employes should be asked to assist in watching the work of the new man, and their opinion as to his ability and attitude should be constantly sought. This should be supplemented and verified, however, by supervisory observation, and first-hand information should be secured before any action is taken."

First Aid Contest

The afternoon session was concluded with a spirited contest between the first aid teams of several of the southeastern cement mills. F. E. Cash, district engineer of the United States Bureau of Mines at Birmingham, was in charge with a number of his assistants acting as judges. The work of all

Lone Star first-aid team

of the teams entered was of very high character and reflects the growing proficiency of the cement mill organizations in this class of work.

Results of the contest, as announced at the close of the dinner, showed that the team of the Lehigh Portland Cement Co., Birmingham plant, captured first honors. The scores attained by the various contestant teams were as follows:

Lehigh, Birmingham plant	98.67
Pennsylvania-Dixie, Richard City plant	97.67
Lone Star, Birmingham plant	97.47
Cumberland, Cowan plant	97.13

All of the scores were considered remarkably good. The winner was presented with the Southeastern Members' Cup.

The dinner party in the evening was an unusually enjoyable affair, celebrating the conclusion of five years of organized safety work by the Southeastern Cement group. Col. H. A. Reninger acted as toastmaster and T. G. Brobston, head of the Birmingham street car lines, was the speaker.

Registration

Alpha Portland Cement Co., Alabama, Birmingham, Ala.—B. H. Adams, plant chemist; H. Busbee, storekeeper; W. L. Dandridge, chief clerk; M. H. Floyd, chief electrician; H. P. Hunter, quarry foreman; F. E. Tuggle, chemist; H. O. Underhill, manager; G. D. Youell, general foreman.

Alpha Portland Cement Co., Pennsylvania, Phoenixville, Penn.—J. O. Breaux, pay department; H. L. McLain, shipping clerk.

Cumberland Portland Cement Co., Tennessee, Cowan, Tenn.—C. G. Bledsac, sack house foreman; W. A. David, electrician; G. J. Hein, auditor; Horace McCollum, physical tester; S. T. Nichols, burner; L. B. Reifsneider, superintendent of raw materials and safety director; G. D. Stames; Oscar Thompson, drill operator; A. J. Tenmey, plant superintendent; Luther Williams, assistant chemist.

Lehigh Portland Cement Co., Pennsylvania, Allentown, Penn.—H. A. Reninger, special representative.

Lehigh Portland Cement Co., Alabama, Birmingham, Ala.—Fred R. Addison, night mill foreman; Newton Bogby, blacksmith; O. C. Brawn, chief clerk; A. Carlson, plant foreman; G. A. Collins, chief electrician; I. W. Cunliff, master mechanic; R. M. Fulton, repairer; R. E. Gudgen, timekeeper; C. E. Harris, chief chemist; W. H. Jones, coal mill; J. B. Moyer, foreman; Hugh Kelley, pump operator; A. Layton, burner; J. H. McFarland, burner; R. H. MacFetridge, superintendent; John O'Brien, quarry foreman; Joe Rooker, raw mill; Will Rose, electrician; H. E. Scoggins, packhouse foreman; P. P. Vacca, shipping clerk; C. F. Walters, bag-house foreman; J. F. Whitley, track foreman.

Lone Star Cement Co. Alabama, Birmingham, Ala.—J. W. Ambers, mill foreman; L. K. Briley, electrician; W. M. Cabaniss, superintendent; W. T. Dowdee, quarry foreman; Jim Elliott, shipping clerk; C. G. Hall, packing foreman; C. E. Kyser, mix chemist; Frank Lehner, master mechanic; W. C. Powell, cont. clerk; A. W. Raab, purchasing agent and chief clerk; O. L. Staggs, clerk; A. D. Stancliff, general superintendent; D. M. Stokes, assistant chief chemist; L. T. Turner, bag house; P. W. Van Sandt, power house operator; George F. Weise, engineer; J. J. Woodman, storekeeper; H. M. Zimmerman, chief chemist.

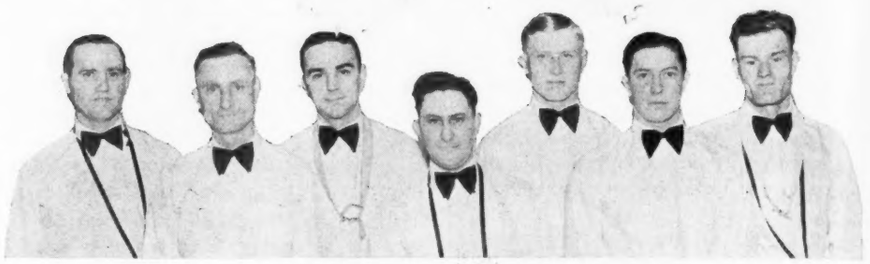
Lone Star Cement Co., Alabama, Jackson, Ala.—F. W. Morris, quarry superintendent; J. G. McVay, electrician; J. L. White, shovel operator.

Lone Star Cement Co., Alabama, Spocari, Ala.—A. W. Brown; W. W. Deadman, superintendent; I. Ghio; J. H. Honeycutt, general foreman; J. A. Nanse, motor tender; J. C. Priester, timekeeper and paymaster; T. T. Speidl, elevator operator; H. A. Tate, blacksmith; E. L. Walker.

Lone Star Cement Co., Louisiana, New Orleans, La.—W. J. Bandorf, foreman; I. C. Brokman, superintendent; E. J. Le Grand, foreman; W. O. Reno, storekeeper.

National Cement Co., Ragland, Ala.—G. W. Canaway, electrician; H. H. Gardner; E. A. Heramptom; Ralph E. Nicholson, vice-president; F. G. Rinnert, quarry superintendent; Willie Soppit; R. R. Weth, safety engineer; Sam E. Wheeler, burner and repairman.

Penn.-Dixie Cement Corp., Georgia, Clinchfield, Ga.—Felix Jones; G. W. Rhodes, chemist; W. G. Riley, safety director.



Cumberland first-aid team

Penn.-Dixie Cement Corp., Tennessee, Kingsport, Tenn.—Norman V. Geyer, assistant superintendent.

Penn.-Dixie Cement Corp., Tennessee, Richard City, Tenn.—S. L. Brannen, shift foreman; Fred Grimer; W. E. Keenee, quarry foreman; J. W. Killian, repairman; R. M. Knight, general mill repairman; A. E. Legg, superintendent; C. E. Nobles, machinist; M. T. O'Connor, draftsman; C. L. Palmer, electrician; J. F. Uhlman, safety director.

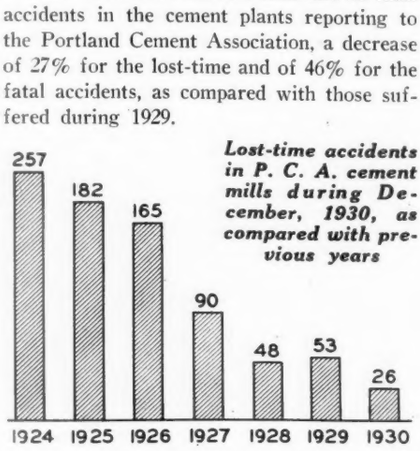
Universal Atlas Cement Co., Alabama, Leeds, Ala.—A. D. Blair, foreman; A. D. Elliott, yard foreman; D. M. Gass, superintendent of labor; R. C. Lee, assistant superintendent of quarry; W. N. McBurns, general mill foreman; O. L. Mitchell, chief electrician; D. N. Sunderburg, assistant superintendent.

Volunteer Portland Cement Co., Tennessee, Knoxville, Tenn.—G. W. Moore, safety engineer; W. E. North, chief engineer.

Miscellaneous—James Elmer Bathurst, head superintendent, education and psychology, Birmingham Southern College, Birmingham, Ala.; T. G. Brabston, superintendent transportation, Birmingham Electric Co., 1030 Fourth Ave., Birmingham, Ala.; Frank Willes Barnett, Birmingham News, Birmingham, Ala.; Tom S. Brown, Hercules Powder Co., Mine Safety Appliance Co., Pittsburgh, Penn.; Frank E. Cash, district engineer, U. S. Bureau of Mines, Birmingham, Ala.; R. C. Crumbaugh, sales—technical, E. I. du Pont de Nemours & Co., Birmingham; A. J. R. Curtis, assistant to general manager, Portland Cement Association; C. H. Dairs, assistant manager, E. I. du Pont de Nemours & Co., 601 Brown Marx Blvd., Birmingham; J. B. Elliott, promoter, located Leeds plant site, 1526 North 20th St., Birmingham; Leon W. Friedman, reporter, industrial editor, Birmingham News, Birmingham, Ala.; M. C. Howee, manager safety department, Allied Engineers, Birmingham; H. B. Humphrey, assistant engineer, U. S. Bureau of Mines, Birmingham; Clyde Hunter, E. I. du Pont de Nemours & Co., Birmingham; O. D. Lindstrom, district manager, Gardner Denver Co., Birmingham; Le Roy Mowery, Bureau of Mines, Jellico, Tenn.; Perkins J. Prewitt, director, Birmingham Safety Council, 202 Protective Life Bldg., Birmingham; Stanley Owens, Portland Cement Association, Chicago; Frank C. Ridley, first-aid miner, U. S. Bureau of Mines, Birmingham; C. E. Saxon, safety instructor, U. S. Bureau of Mines, Birmingham; Mark Small, district engineer, Portland Cement Association, Birmingham; Commissioner Taylor, Birmingham; Kenneth Urquhart, Gardner-Denver Co., 716 North Ninth St., Birmingham; F. B. Winslow, auditor, I. C. I. R. R. Co., president Birmingham Safety Council; A. H. Witt, Mine Safety Appliances Co., 109 South 21th St., Birmingham, Ala.

Cement Mill Accidents

PRELIMINARY totals for 1930 show that there were 525 lost-time and 20 fatal accidents in the cement plants reporting to the Portland Cement Association, a decrease of 27% for the lost-time and of 46% for the fatal accidents, as compared with those suffered during 1929.



Lost-time accidents in P. C. A. cement mills during December, 1930, as compared with previous years

Over the five-year period ending with 1930 the results show a decrease of 79% for the lost-time and 69% for fatal accidents.

These results indicate that the reduction of accidents in the cement mills still continues at an encouraging rate.

During December, 1930, the accident record of the industry hit another all-time low point, with a total of only 26 lost-time accidents. It was the fourth month during 1930 for which there were no fatal accidents. Other months completed without fatals were April, June and November. Lost-time accidents for December were 50% below those for December, 1929, and 85% below those for the corresponding month five years ago.

The first month of 1931 shows a surprisingly low record of 10 lost-time accidents with no fatals. No attempt has been made as yet to compare this with past figures, as it is believed to reflect quite a general condition of operating shutdowns and a considerably smaller working force than is usually employed at this season of the year.

Two Fatal Accidents at Cement Operations

ARCHIE HALL, 25, a free employe at the Michigan state cement plant at Chelsea, Mich., was instantly killed February 12 when his clothing became entangled in the machinery used to pulverize coal. He had been in the state's employ about five years.

* * * * *

Ira S. Luckenbach, of Northampton, Penn., died at the Haff hospital February 14 of injuries which he received in a fall down a 30-ft. embankment.

Mr. Luckenbach was found lying on the ice of Hokendauqua creek at the foot of an embankment that borders 20th street, Northampton, in the vicinity of the plant of the Universal Atlas Cement Co., at which he had been employed for 15 years.

Cement Tariff Hearing Postponed

THE HEARING by the United States Tariff Commission on portland and other hydraulic cements set for March 12 has been postponed until April 14. The notice of the meeting was published in ROCK PRODUCTS, February 14, p. 82; it will be held in the offices of the Tariff Commission, Washington, D. C.

New Canadian Gravel Plant in West

GRAVEL PRODUCERS, LTD., Lethbridge, Alta., a company largely backed by local capital, has been awarded the contract for the supplying of gravel to the new government terminal elevator, it is learned.

The plant of the company is situated almost straight west of the city power house, a few yards from the river bank. Two large elevated bins, one of which will likely hold gravel and the other sand, have been constructed and a float is being built in the river to hold much of the machinery to run the plant. It is said that the plant, when completed, will be able to handle 18 cu. ft. of gravel per min.

Chester Langdon, of Blairmore, has the contract for construction of the plant and Thos. Kennedy of this city has been employed as bookkeeper. A staff of four men is now engaged at the construction work and it is possible that the plant may begin operations early next week.

Electric motors, pumps, a rock crusher and other machinery is on the site and a flume for supplying water to the plant has been constructed from some little distance up the river. The bins, capable of holding a large quantity of gravel, have been built on the river bank with no concrete footings, indicating that it may not be the intention of the company to leave the plant permanently on the present site.

Gravel Producers, Ltd., is incorporated in Alberta for $20,000, 2000 shares at $10 each, and the head office is in Lethbridge. The memorandum filed with the government was signed by Leonard C. Cornell, Bessie B. Rose and F. M. Rose.—*Lethbridge* (Alta.) *Herald.*

New Gravel Plant for Cincinnati Territory

A TRACT of twenty acres on Springfield pike, opposite the Carthage fair grounds, has been leased by the North Cincinnati Sand and Gravel Co., Inc., from the Caldwell estate. The gravel company recently underwent a reorganization and added new capital. It will start to erect its sand-washing plant next week and move from its present location on Granite avenue, Reading. The tract extends from Springfield pike westward to Mill creek.—*Cincinnati* (Ohio) *Times-Star.*

American Silica Corp. Sold to Bond Holders

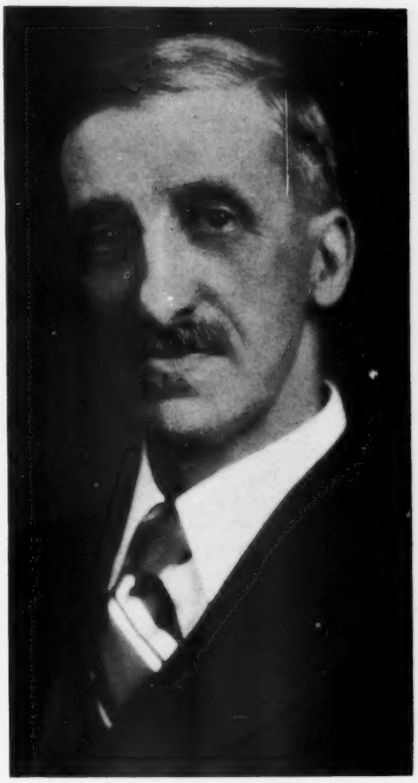
THE American Silica Corp., one of the principal industries of Ottawa, Ill., was sold at public auction at the office of William Zwanzig, referee in bankruptcy, February 5. The property of the million and a half dollar corporation was bid in by representatives of the bond holders' protective committee for those holding bonds under the trust deed of the property of the Central Trust Co. of Chicago for $250,000.

The sale was made by Fred E. Hummel, trustee of the concern. It is subject to the approval of Referee Zwanzig. Several bidders were in the field for the company.

The sale will make no difference in the present operating plans of the concern. Officers of the corporation filed a voluntary petition in bankruptcy several weeks ago.—*Peru* (Ill.) *Herald.*

New Superintendent of Columbia Cement Plant

ROBERT W. McALLISTER was recently chosen superintendent of the East Fultonham, Ohio, plant of the Columbia Cement Division of the Pittsburgh Plate Glass Co. to succeed the late Robert Parsons. Mr. McAllister went to Zanesville in 1924 as chief engineer when the cement plant was built.



Robert W. McAllister

Mr. McAllister is a Scotsman and received his technical training in Glasgow, Scotland. He came to this country 22 years ago and was with the Babcock and Wilcox Co. at Barberton in various capacities for 10 years. During the world war he was works superintendent of the shell shops in the Babcock and Wilcox plants at Barberton, manufacturing 9.2-in. shells for the British government. He joined the Pittsburgh Plate Glass Co. at the Barberton plant in 1922, being connected with the efficiency department.

Basic Products Co. Leases Kennedy Refractories Co.

CONTROL of the Kennedy Refractories Co. properties at Bettsville, Ohio, passed February 20 to the Basic Products Co. of Pittsburgh, Penn. The Basic Products Co., which operates plants at Peeples, Ohio, Lawton, Ky., and Kenova, W. Va., leased the Kennedy properties for a 10-year period.

Stone quarries, a refractory plant, trade names and good will of the Kennedy company are included in the deal. Organization of the Kennedy Securities Co. as a holding concern to receive rentals followed the leasing.

Harry A. Kennedy, of Pittsburgh, and his sons, Philip B. and Robert H. Kennedy, of Tiffin, Ohio, are the incorporators. Philip B. Kennedy was elected president and treasurer and Robert H. Kennedy, secretary of the Securities company.—*Cleveland* (Ohio) *Plain Dealer.*

Washington State Lime Project

THE SUPERIOR LIME PRODUCTS CO. has recently acquired an additional hundred acres of land surrounding the lime deposits east of Okanogan, Wash., which it expects to work soon, according to J. J. Keegan, Wenatchee mining man, who is backing the project.

Added to the 20 acres already held by the company, this holding will be sufficient to protect the limestone deposits of the concern.

Assayed by the Colorado Assaying Co. samples of the limestone here turned out the following results: Calcium carbonate, 95.28%; moisture, 00.35%; silica, 1.60%; iron oxide, 00.42%; aluminum oxide, 00.14%; magnesium carbonate, 1.9%, and phosphorus pentoxide, 00.08%.

Mr. Keegan is well known in mining circles in north central Washington. He has been for several years associated with the Keegan Clay Products Co. in Wenatchee operating a large clay pit near the city.

Associated with Mr. Keegan here is Y. L. Redhead, salesman. The two men report great interest being shown by the business men of Okanogan in the project and predict that it will not be at all difficult to secure sufficient backing to go ahead with the development work at once.—*Okanogan* (Wash.) *Independent.*

Eau Claire Sand and Gravel Co. to Build New Plant

THE Eau Claire Sand and Gravel Co., 321½ Eau Claire street, Eau Claire, Wis., has completed plans for construction of a new sand and gravel plant. Work will begin soon, according to officials, and when completed the new plant will have a capacity of 50 cars daily. A. Owen Ayres is president and general manager of the concern.—*The Western Builder* (Milwaukee, Wis.)

Foreign Abstracts and Patent Review

Blending Raw Flour in Cement Plants. H. Lefort discusses in his article, "The Preparation of Raw Materials in Cement Plants," the general aspects of preparing the raw materials for making cement by the wet and the dry processes, and alludes to recent developments (Rock Products, XXXIII, 1, p. 92). He stresses the importance of blending the raw materials for the composition desired. How this may be done in the dry process is shown by means of three flow sheets as follows:

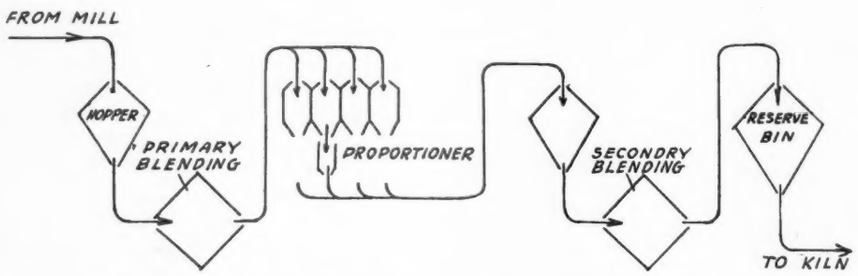


Fig. 1. The raw flour passes from mills to a receiving hopper and is then delivered to a primary blending system

In Fig. 1 the raw flour passes from the mills to a receiving hopper and is then delivered to a primary blending system. The material is then delivered in separate batches into silos and each batch analyzed. Then the material is drawn to a mixer, the quantity from each silo being adjusted in accordance with the analyses made of them. The mixed raw flour passes then to the secondary blending system, and then to the reserve bin, from which it is delivered to the kiln as needed.

The operating principle may be modified to that shown in Fig. 2, in which a special blending apparatus or mixer is used. In this method the mixing is effected by a suitable manipulation of the valves *v*. The raw flour passes from the mill direct or by way of a receiving hopper to the blending apparatus. Then the material can be passed to the reserve bin of the kiln as before, depending on its composition and the composition desired.

Pneumatic conveyance may be applied to the blending process. In Fig. 3 the raw flour passes from the mill by way of a receiving hopper to any one of the three silos of the blending device or directly to the reserve bin of the kiln or direct to the kiln. The three blending silos are operated in rotation individually for filling, mixing and discharging. The material is then delivered either directly to the reserve bin or to any one of the three silos of the proportioner, from which it passes, following individual analysis, by way of the traveling scale or bascule to any one of the three silos of the blending device, from which it passes again to the proportioner or direct to the reserve bin, from which it enters the kiln as needed.

The dry process thus lays claim to a similar perfection to that of the wet process, and the choice of either depends on the cost of producing cement with it. A table gives the cost of producing cement by the wet process with filters, the wet process with driers and the dry process with blending devices, as shown below.

These figures are approximate and the costs may be reduced by various means of recovering the waste-gas heat, or reducing fuel consumption. The idea of using filtration in the wet process was first suggested in 1902 by M. E. Leduc in his book, "Chaux et Ciments," and first applied in 1923 in the Ford cement plant at Detroit.—*Revue des Materiaux de Construction et de Travaux Publics* (1930) **250**, pp. 249-252.

Process employed	Special apparatus Designation	Charge	Values (French) per ton of clinker — Fuel consumed Weight	Price	Economy on energy recovered Kw. hr.	Price	Balance price
Dry	Homogenizer	1.75	0.240 t.	36.00	85	9.35	28.40
Mixed	Filter	5.10	0.220 t.	33.00	55	6.05	32.05
Wet	Drier	2.20	0.220 t.	33.00	55	6.05	35.20

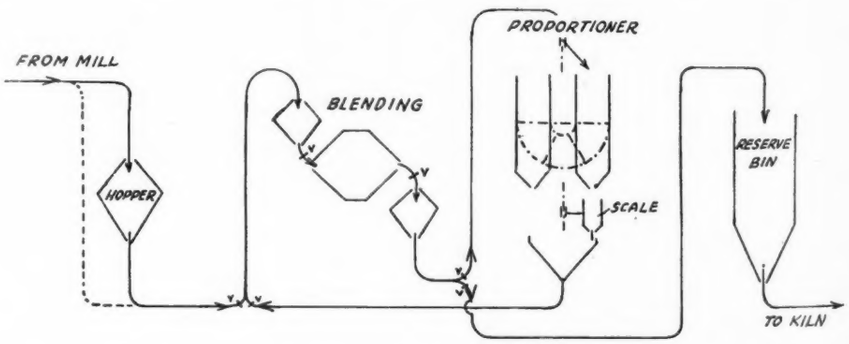


Fig. 2. The operating principle may be modified as shown, a special blending apparatus or mixer being used

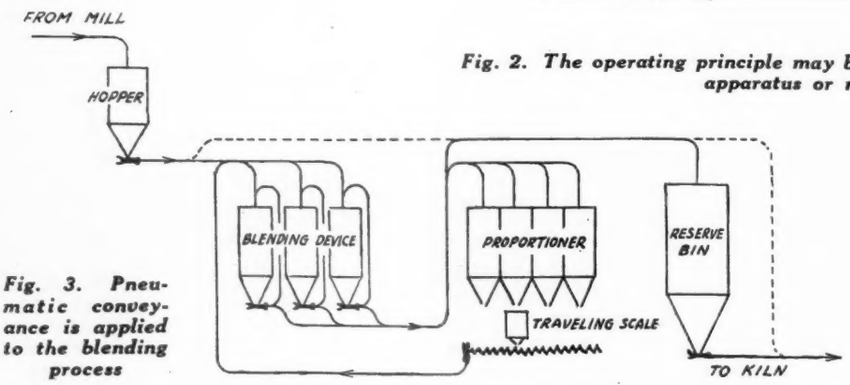


Fig. 3. Pneumatic conveyance is applied to the blending process

Influence of Graded Aggregates on Concrete. Paul Hertel discusses the granular composition of aggregates prepared in accordance with the Fuller, Gruen, Hermann, Graf and Otzen curves, and then reports on his tests made to determine their influence upon concretes prepared with various kinds of cement. Judging from the data

given in the tables, the aggregates prepared in accordance with the Otzen curve give the best quality concrete; and those prepared in accordance with the Fuller curve give the second best, but sometimes nearly equal quality concrete. The granular composition of the Otzen and Fuller aggregates is as follows:

Aggregate mm.	Per cent. granular size in millimeter —Sand— 0-0.24	0.24-1	1-3	3-7	—Gravel— 7-12	12-251
Natural aggregates						
Fuller	2.7	11.1	10.8	13.8	16.8	44.8
	2.7	13.8	24.6	38.4	55.2	100
Otzen	4.1	10.5	13.9	17.7	17.9	35.9
	4.1	14.6	28.5	46.2	64.1	100
Artificial aggregates						
Fuller	5.4	10.7	11.6	13.3	16.1	42.9
	5.4	16.1	27.7	41.0	57.1	100
Otzen	4.2	9.6	15.4	20.6	17.4	32.8
	4.2	13.8	29.2	49.8	67.2	100

—*Zement* (1930) **19**, Nos. 46, 47, 48, 49.

Recent Process Patents

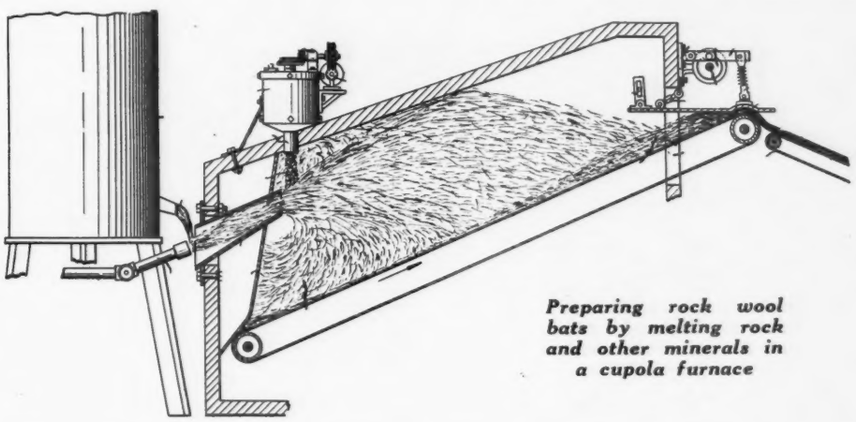
The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Aluminate Cement—Fertilizer Material. Quick-hardening aluminate cements have heretofore been produced by fusing aluminiferous material with limestone in proper proportions. Also, phosphoric acid has been produced by fusing together calcium phosphate, silica and carbon, resulting in volatilizing the phosphorus.

One of the main features of this patent is that the lime required for the preparation of the calcium aluminate is furnished by the phosphate rock or calcium phosphate. Thus the patentee proposes to fuse phosphate rock, low in silica, with an aluminiferous material, such as bauxite, under reducing conditions at temperatures of approximately 1200 deg. C. to 1600 deg. C., thus producing phosphorus and an aluminate cement all in one operation.—*Herbert H. Meyers, assignor to Armour Fertilizer Works. U. S. Patent No.* 1,778,224.

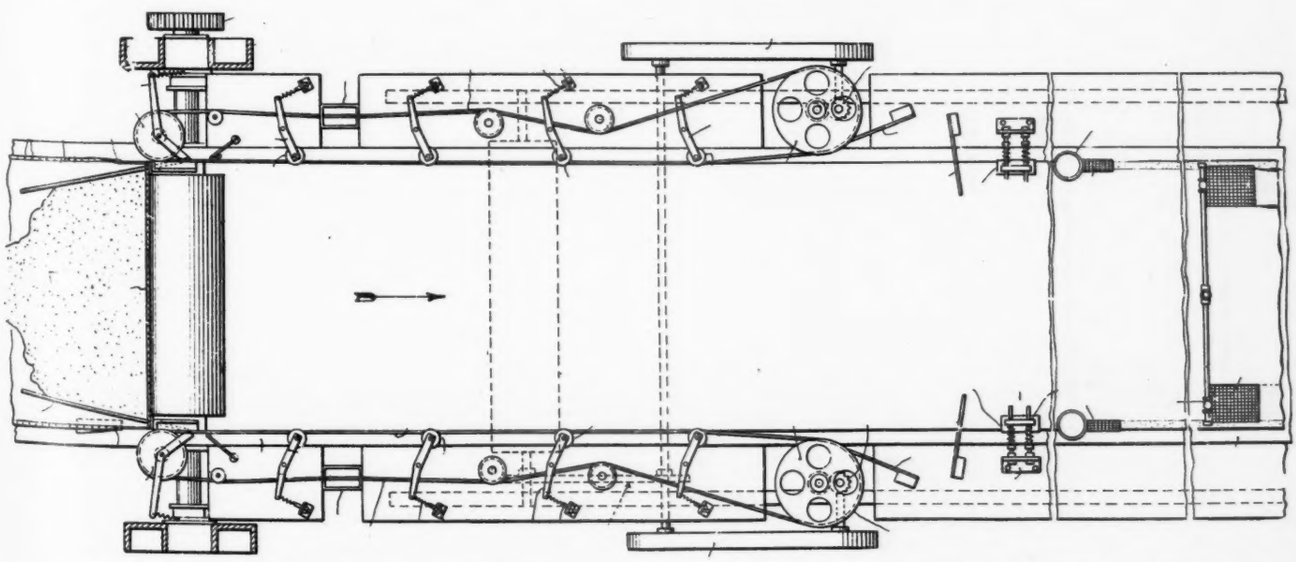
Process of Making Rock Wool Bats. The patentee describes a method of preparing rock wool bats by melting rock and other suitable minerals in a cupola furnace and allowing the molten rock to be later atomized in a separate chamber. As the fibers are being formed, they are treated with a cementitious material in a dry, powdered form, the cement being of such a nature that it becomes softened due to the heat and causes the fibers to adhere to each other to form a felted blanket or bat.—*William L. Miller. U. S. Patent No.* 1,765,026.

By-Products Gypsum. A method of recovering gypsum from calcium phosphate sludges that are residues from phosphoric acid manufacturing plants is proposed. The inventor washes the gypsum sludges with a very dilute and highly ionized sodium chloride solution so as to lend a maximum mechanical manipulation as well as reasonable chemical activity. After the free phosphoric acid in the gypsum sludge has been transposed to sodium acid phosphate according to the reaction: $NaCl + H_3PO_4 + H_2O = NaH_2PO_4 + HCl + H_2O$, he further neutralizes the sludge with lime. With the acid completely neutralized its deleterious action is removed and the compounds formed are said to give the plaster greater strength and to act as a stabilizer.—*Robert S. Edwards, assignor to Rumford Chemical Works. U. S. Patent No.* 1,770,367.



Preparing rock wool bats by melting rock and other minerals in a cupola furnace

Plaster Board Machine. The inventor describes and illustrates in considerable detail his method of constructing a plaster board apparatus comprising a method of advancing the cover sheets over a perforating device for perforating the margins and for folding the margins. He also describes means of depositing plaster on the sheets between the folder margins and for affixing the cover sheet. An endless band is arranged to contact the edges of the board to iron out and make a smooth finished edge. By mutilating or perforating the margins of the lower sheets, a better bond is secured at the edges.—*Charles Spangler, assignor to Certain-teed Products Corp. U. S. Patent No.* 1,751,953.



Plaster board apparatus, showing method of advancing the cover sheets over a perforating device for perforating and folding the margins

New Cement Products Industry for Boise, Idaho

ONE OF THE NEWEST VENTURES in progress in the capital city of Idaho, Boise, is that being conducted by the Boise Cement Products Co.

Products of the new business are concrete tile for construction purposes. The company has Ada and Canyon county as a territory to supply with the construction material. The tile making concern is the only such venture in this section and promises to be one of the big industries of the city.

The company is strictly an Idaho concern, being organized by local men. L. S. Honstead is president; Charles A. Nelson, vice-president, and Antone Popp, secretary. The plant is located at 2220 Fairview avenue.

Factory wheels have been turning since November 10, 1930. The company, although commercially operating, is chiefly engaged at present in turning out tile for construction of its permanent factory building.

Tile made are compressed and come in 40 different colors. They are formed entirely by machinery and steam cured in long kilns. They are well established as a material for all kinds of building, both commercial and private. The small hollow blocks come in sizes from 4 by 4 to 8 by 8 in. of 13-in. lengths. They will stand 3200 lb. pressure to the square inch.

Plans are also being made for the construction in Boise in the near future of a five-apartment house, to be the latest thing in the way of convenience. This company's tile will be used. The structure is to serve chiefly as a material illustration of the product, known as Duntile. Later, after the company is finally established and fully operating, a roofing material will be turned out by the factory.—*Boise* (Ida.) *News.*

Texas Gypsum Products Industry Picking Up

THE Certain-Teed Products Co., owner of the plaster and board mill at Acme, Tex., west of Quanah, is now operating both the brown mill, or where ordinary plaster is made, and the board mill, which makes wall board.

The brown mill has been working since January, but the board mill was not opened until the first week in February.

The company is giving employment to a number of men in the laying of a narrow-gage railroad into the gypsum deposits, which are located a mile or more from the plant. Preparation is being made to get the plants ready for full time operation when the demand for gypsum products again becomes normal.

Opening of the mills is an index that building operations are on the increase. While not apparent in northwest Texas, yet some of the larger cities reflect better building programs than for any time in the past 18 months.—*Wichita Falls* (Tex.) *News.*

Kansas City Lime Products Plant Enlarged

EXPANSION of the Evans Lime Co. plant, including two building enlargements, construction of one new building and installation of additional equipment is under way at Kansas City, Mo. The plant spreads over a half-acre site on 79th street terrace east of Wornall road. The factory, in the Waldo industrial section, is served by direct switching connection.

The company's capacity for producing stucco for both interior and exterior walls, which is turned out in 114 different shades, will be doubled. A second grinding machine will be added. The building in which that department is housed will be enlarged, as will the plant unit in which lime putty for interior wall surfaces is made. A new building will be erected for production of wax for interior decorating.

D. A. Evans, owner of the company, developed the patented process by which he produces lime putty, an important material for interior walls.—*Kansas City* (Mo.) *Star.*

New Southern Gravel Producer

THE THOMPSON WEINMAN CO., Cartersville, Ga., is completing the erection of bins to be used for shipments of sand and gravel from its Cartersville plant. This company has a grinding plant here at which a considerable tonnage of limestone is ground, as well as barytes, and in securing raw material considerable gravel overburden is handled, which until the erection of the bins was discarded.

This material, after being washed, is delivered to the plant over an aerial tramway, a distance of approximately 2½ miles. The gravel production capacity is about 250 tons of washed gravel per day. Shipments can be made over the Louisville and Nashville R. R., the Seaboard Air Line and the Nashville, Chattanooga and St. Louis R. R. W. J. Weinman is president of the company and A. Weinman superintendent.

Wisconsin Mineral Aggregate Producers Form New Association

THE Sand, Gravel and Stone Co-Operative Association of Wisconsin has just been incorporated in Milwaukee. The incorporators are Otto W. Lutz of Edward Lutz Sand and Gravel Co.; Henry Jaeger of Jaeger Sand and Gravel Co., Inc., and A. A. Retzlaff of State Washed Sand and Gravel Co.

The stated objective of the organization was "to obtain for the sand and gravel industry a fair price for its products."

A code of ethics has been drawn up for acceptance by the marketing department of the state department of agriculture.

Gravel Plant for Centerville, Michigan

WITHIN a few weeks the Michigan Concrete Material Co., of Detroit, will open a plant near Centerville, employing about 40 men. Representatives of the company, prospecting for gravel deposits, located a stratum over 34 ft. thick on Barney Bickel's 60-acre farm near here and the company leased the tract. The company furnishes gravel for contractors and manufactures tile, brick, and other cement products.

A pipe line 800 ft. in length will be built to the river and a sidetrack laid from the Michigan Central railroad to the plant. The offices will be located here.—*Michigan Contractor and Builder.*

New Quarry Operation for Kentucky

GROUND was broken February 5 for the new Hopkinsville Stone Co., which will locate its quarry a half mile north of Hopkinsville, Ky., between U. S. Highway 41 and the railroad and will produce stone for road building and general construction work.

Incorporators of the new company are A. W. Partee, Hopkinsville; Gates W. Young, Owensboro, and W. H. Petri, Lewisport. J. D. Woodruff is in charge of construction which is expected to be completed within 60 days.

The new company plans to produce approximately 1000 tons of stone daily as soon as it gets into complete operation. Besides the various kinds of stone it will also produce agricultural lime and other similar materials.—*Hopkinsville* (Ky.) *New Era.*

Pennsylvania Quarry to Enlarge Output

IMPROVEMENTS contemplated at the Youghiogheny Crushed Stone Co. plant at Casparis, Penn., near Connellsville, will provide employment for a hundred additional men, George Vang, of Pittsburgh, president of the company, announced recently. The improvements, to cost $175,000, are to begin soon. They include, Mr. Vang said, a road surfacing plant with a capacity of 1200 tons daily, and facilities for increasing the ballast output to 40,000 tons monthly.

New California Lime Project

PLANS are under way by Auburn Chemical Lime Co., Auburn, Calif., recently organized with capital of $200,000 by Hugh T. Dyer, Auburn, engineer, and associates for development of lime properties near Rattlesnake Bar, vicinity of Auburn. Mechanical handling, loading and other equipment will be installed. Mr. Dyer is president and general manager.

New Type of Synchronous Motor for Tube-Mill Drive

Lawrence Portland Cement Co. of Siegfried, Penn., Made First Installation on Heavy Starting Drive—Operating Experience

By R. S. Wright
Westinghouse Electric and Manufacturing Co., East Pittsburgh, Penn.

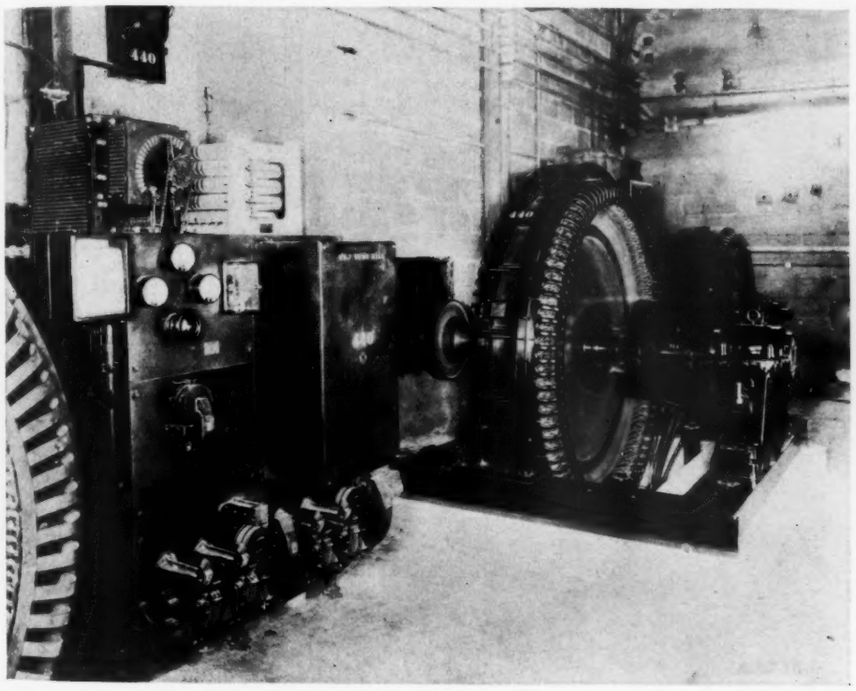


Fig. 1. Motor installation at Siegfried, Penn., cement plant

THE FIRST INSTALLATION of the new "Simplex" type of synchronous motor (described briefly in ROCK PRODUCTS, January 3, 1931, pp. 155-156) was made at the Siegfried, Penn. plant of the Lawrence Portland Cement Co. in September, 1929. This motor, rated 300 hp., 2200 volts, 100% p.f., 164 r.p.m., is coupled to the pinion shaft of a tube mill in the grinding department. Fig. 1 is a view of this motor installation with the controller in the foreground.

The desirable starting and accelerating characteristics result from the use of a damper winding of special form. This damper winding consists as usual of a single conductor per slot in the pole face, but instead of being connected to short-circuiting end rings, these conductors are phase-connected with the ends brought out through slip rings to an external starting resistor. This resistor is automatically cut out in steps by the controller as the motor accelerates. The ratio of starting torque to starting current is increased by open-circuiting the field winding during starting. This results in a high power factor during starting as compared with that obtained when the field winding is closed upon a resistor in the ordinary manner.

The practice of open field starting results in a high voltage being induced in the field winding by transformer action. Since the induced voltage is at its maximum at standstill and decreases to zero at rated speed, it is only necessary to reduce the number of field turns connected in series from zero to approximately 60% speed. In this motor a centrifugally operated switch, mounted in the rotor, breaks the field into two sections, thus limiting the induced voltage to a safe value. The field winding is designed for operation on 125 volts, d. c. The rotor of this motor is shown in Fig. 2. The sectionalizing switch was adjusted during the motor test to close at 85% of rated speed, insuring that closure occurs only upon the existence of a pre-determined low percentage of induced field voltage. The mechanism is so arranged that upon stopping the motor the switch maintains its closed position until 35% of rated speed is reached, permitting the field to be connected to a discharge resistor and opened in the usual way by the field switch on the control panel.

The following test results were obtained from this motor:

Pull-in torque at 5% slip	*115%
Maximum starting torque	*210%
Locked starting Kv-a.	*460%
Ratio of starting torque /Kv-a	.46

In a synchronous motor of standard type of construction developing the above torques, a ratio of starting torque /Kv-a. of .30 is considered good and the physical size of such a motor is considerably larger than the Simplex.

Developments made since the installation of this motor have resulted in much higher starting torque /Kv-a. ratios. Therefore, after more than a year of satisfactory operation the rotor was returned to the factory to be revamped to include the latest features.

The main feature of this new rotor is a laminated pole rim held between heavy, one-piece steel end plates. This rim construction minimizes the eddy currents circulating in this member during starting. The sectionalizing switch mounted in this new rotor is a two-pole type for breaking the field into three sections to permit the use of 250-volt excitation. This switch is a self-contained unit with all current carrying and moving parts protected by a dust-tight, welded steel housing. Fig. 3 shows a similar type of rotor with the sectionalizing switch in place.

With this new rotor the following test data were obtained:

Pull-in torque at 5% slip	122%
Maximum starting torque	230%
Locked starting Kv-a.	396%
Ratio of starting torque /Kv-a	.58

From these test results it will be seen that the ratio of starting torque /Kv-a. was increased 26% by the rotor improvements. The ratio of starting torque /Kv-a. obtained with the Simplex motor is approximately twice as good as with a motor of standard type of construction. In addition the frame size is smaller, the efficiencies are higher, and the exciter kilowatt requirement is about the same.

The results obtained with the Simplex motor depend to an unusual extent upon

*All values of torque and Kv-a. are given in per cent. of rated full load values.

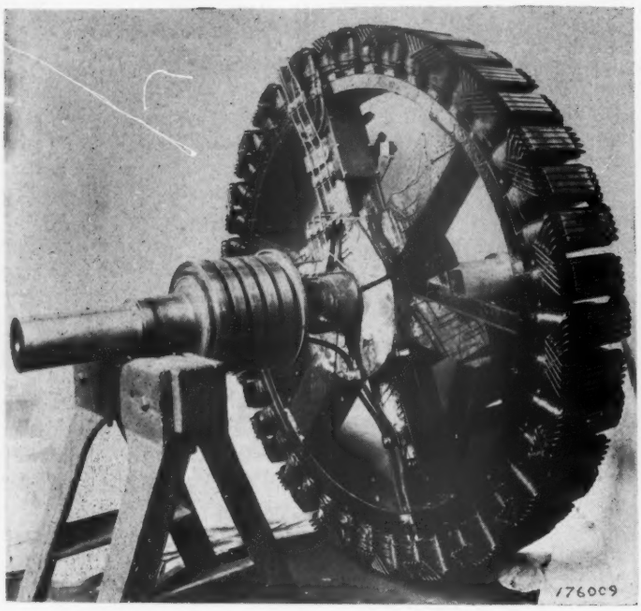


Fig. 2. Rotor of new type of motor for tube mill drive

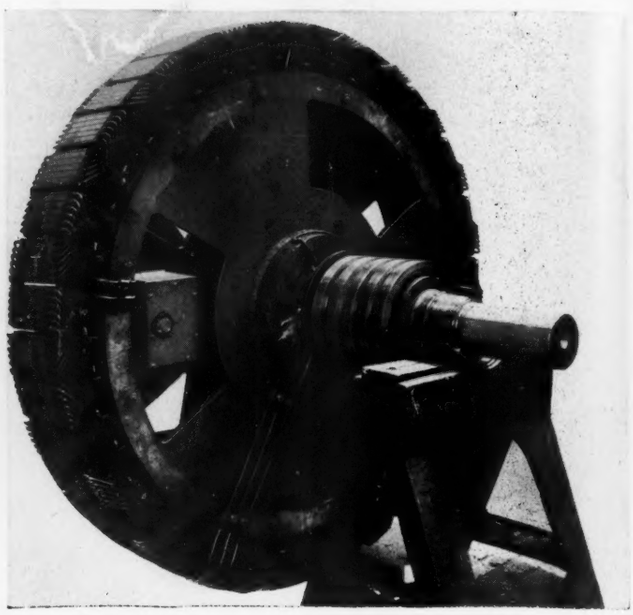


Fig. 3. Similar rotor with sectionalizing switch in place

proper functioning of the control equipment. Fig. 4 is a shop view of the controller supplied with this 300-hp., 164-r.p.m., 2200-volt motor. The controller is of magnetic, definite time limit type in which the sequence of starting operations is controlled by a motor driven master drum. In addition to the usual primary switch, field switch, field discharge resistor, and overload relays, the controller employs a starting resistor and two accelerating contactors for the damper winding circuit, and a spring-closed auxiliary field switch.

The magnet of the oil-immersed primary switch is shown mounted on the middle left panel and the two accelerating contactors on the lower panel of each section. The metering equipment comprises a d.c. field ammeter, an a.c. line ammeter, and a polyphase indicating wattmeter. This latter meter gives a convenient and accurate indication of the mill charge condition at all times.

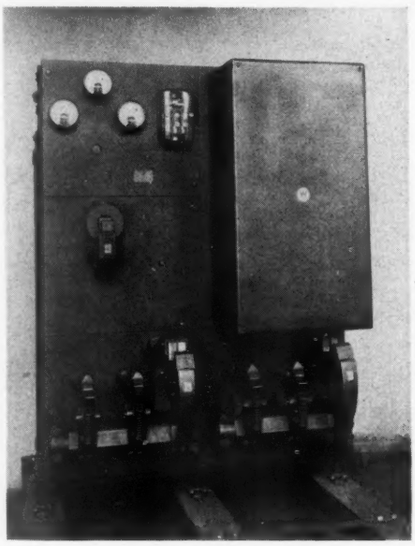


Fig. 4. The controller

The entire equipment is especially designed for operation under the dusty conditions prevalent in cement mills. The motor collector assembly is enclosed in a dust proof housing which reduces brush wear and all control relays, interlocks, small contactors, and the master drum switch, are mounted under dust tight covers which fit snugly against the panel surface.

The operation of the equipment may be readily understood by referring to the elementary controller diagram Fig. 5-a and the speed-torque curves Fig. 5-b. When the start button is closed the motor-driven master drum rotates and causes the auxiliary field switch No. 41-A to operate and open the field which is already sectionalized by the centrifugal switch C.S. The primary switch No. 5 closes and the motor starts

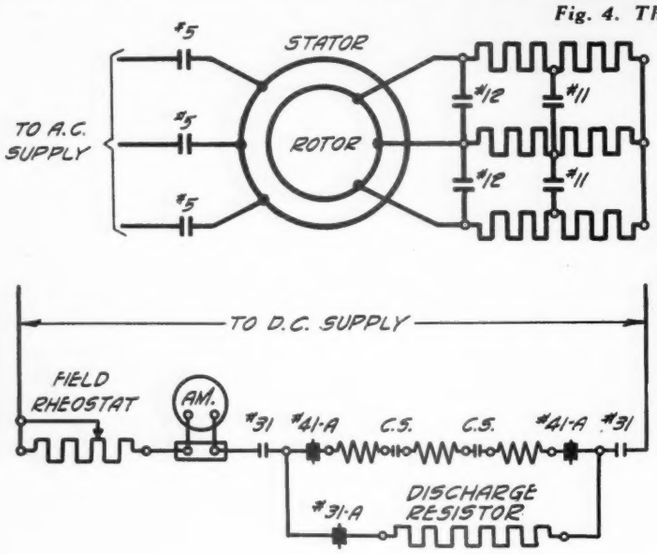


Fig. 5a

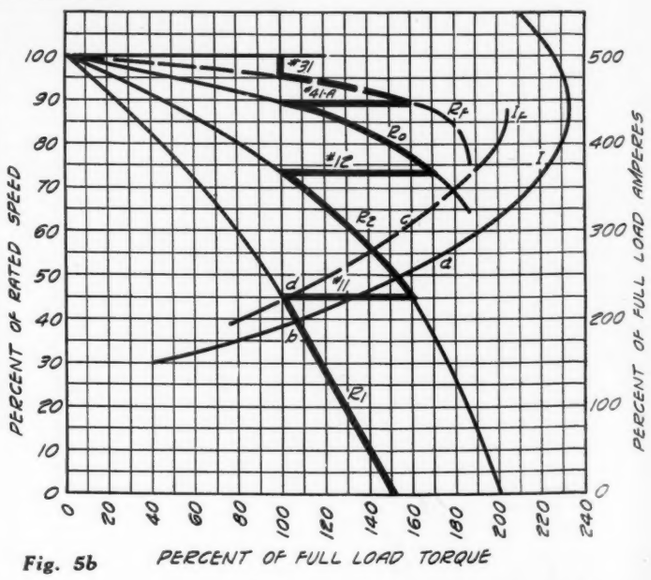


Fig. 5b

with sufficient resistance in the damper circuit to give the desired initial torque, in this case 150%. The motor accelerates along R_1 until it reaches a balancing speed at the load torque and operates at this speed until the master switch operates No. 11. This shorts out part of the external resistance causing the motor to accelerate along R_2 and after a definite time No. 12 closes to short out all of the external resistance. The motor then accelerates along R_0 and next the field is closed on the discharge resistor by having the coil of No. 41-A de-energized. The field winding now develops a considerable torque which adds to the torque of the damper circuit and the motor operates along a still higher curve R_F. The primary current is then read on curve I_F. After another predetermined interval, the direct-current field excitation is applied by No. 31 and the motor synchronizes. The discharge resistor is removed from the circuit by opening of No. 31-A and the accelerating contactors No. 11 and No. 12 are de-energized.

Should the initial torque be insufficient to start the mill the motor remains at rest a few seconds until No. 11 closes, at which time it develops a starting torque of 200%. Should this torque fail to start the mill an overload relay, which is effective at all times, will remove the motor from the line before it suffers injury. The control is so arranged that the master drum cannot rotate to the position where it closes the primary switch if the centrifugal switch is closed. In other words it is impossible to start the motor with all sections of the field winding connected in series.

The starting resistor is of the ordinary grid type and the starting torque may be varied to suit the particular installation by changing the location of the taps. The starting current will of course vary accordingly; i. e., if the torque is reduced the starting current will be reduced and vice versa.

The control is entirely automatic and all responsibility for correct starting is taken out of the hands of the operator who merely manipulates a Start-Stop pushbutton located in the mill room. The motor may be inched while on the first point of the control; i. e., prior to closure of No. 11. This makes "spotting" the mill, when it is necessary to renew the charge, a simple operation.

Fire Damages Repair Shop of U. S. Gypsum Co. at Fort Dodge, Ia.

FIRE of unknown origin on February 3 destroyed the west end of the round house at the quarry of the United States Gypsum Co. plant east of Fort Dodge, Ia.

The building is a long frame structure used as a repair shop for the quarry cars and for storing repair parts and equipment. It originally housed the locomotives formerly used at the plant.

The fire started in the electric shop located in a corner of the building, spreading up the wall to the roof. Electrical equipment, a water softener and control board which were located in the burned part of the building were damaged by the flames, but the office and store room, where repair parts are kept, were untouched.

F. J. Reinking, manager of the plant, would make no estimate of the loss from the fire, as an inventory had not yet been taken. He did say, however, that the fire would not halt the operation of the plant in any way.

"I also want to speak a word of commendation for the fire department," he said. "They did a fine piece of work. The building would have gone but for them. I wish to commend them highly for the efficient manner in which they fought the fire."—*Fort Dodge* (Ia.) *Messenger.*

Synchronous Motors for High Starting Torque

THE EDITOR: Referring to your January 31 issue, I find that I have been misquoted. The third paragraph of your report on my paper at the National Crushed Stone Association convention reads as follows:

"The synchronous type motor, especially useful in improving a bad power factor, as well as having a high efficiency, has come into very general use where too much starting torque for a slip-ring motor is required, according to Mr. Borland."

This statement is not correct. In my paper on "The Use of Electricity in Handling Stone," I explained briefly the operating characteristics of the synchronous motor and mentioned that "with modifications in design to provide higher starting torque and accelerating speed torque characteristics, the field of application has been extended to include high starting torque drives, such as crushing and grinding machinery." I also went on further to explain that different manufacturers had devised various means to provide the high torques demanded by such applications and at the same time hold the starting current to moderate values. One of these designs uses the ordinary salient pole type of rotor with practically normal mechanical construction throughout, but with the damper winding connected in phase groups and through collector rings connected to external starting resistors, as with the wound-rotor motor. This motor provides starting characteristics similar to those of the wound-rotor machine. The design has the advantage of providing the required starting torque and moderate starting current with simple mechanical construction.

Where synchronous motors have been applied in such service the principal reason has been its better power factor characteristics and frequently a slightly better efficiency.

The starting torque and accelerating torques of the slip-ring induction motor are well adapted to such drives and where the synchronous motor is given preference it is for the reasons noted above and not because the drive demands too much starting torque for the slip-ring motor.

The second paragraph of your report includes the statement—"While a wound-rotor or so-called slip-ring motor is desirable where the load is hard to start." This, obviously, is not consistent with the third paragraph, as I have explained in the foregoing.

J. E. BORLAND,
General Engineer, Westinghouse Electric and Manufacturing Co.
East Pittsburgh, Penn.
February 13, 1931.

Sand-Lime Brick Production and Shipments in January

THE following data are compiled from reports received direct from 21 producers of sand-lime brick located in various parts of the United States and Canada. The number of plants reporting is one more than those furnishing statistics for the December estimate, published in the January 31 issue. The statistics below may be regarded as representative of the entire industry in the United States and Canada.

Reports for the month of January indicate that production has decreased considerably, ten of the plants reporting "no brick produced during this month." Shipments by rail and truck likewise decreased, as did stocks on hand and unfilled orders.

Average Prices for January

Shipping point	Plant price	Delivered
Atlantic City, N. J.	$ 9.50	$14.00
Detroit, Mich.	14.00	15.50
Detroit, Mich.	15.50	.....
Detroit, Mich.	13.00	14.50
Grand Rapids, Mich.	14.00	.....
Iona, N. J.	12.00	14.00
Jackson, Mich.	13.00	.....
Menominee, Mich.	11.00	13.50
Milwaukee, Wis.	.....	13.00
Mishawaka, Ind.	11.00	.....
Pontiac, Mich.	11.00	13.00
Saginaw, Mich.	12.00	.....
Sioux Falls, S. Dak.	12.00	.....
Syracuse, N. Y.	18.00	20.00
Toronto, Can.	11.00	13.00
West Toronto, Can.	.....	12.00
Winchester, Mass.	.....	12.00

The following statistics are compiled from data received direct from 21 producers of sand-lime brick in the United States and Canada:

Statistics for December and January

	*December	†January
Production	6,053,440	3,718,025
Shipments (rail)	1,845,820	910,377
Shipments (truck)	4,276,957	3,366,634
Stocks	12,070,012	11,593,938
Unfilled orders	9,125,000	5,245,000

*Twenty plants reporting. Incomplete, two plants not reporting stocks on hand, and five not reporting unfilled orders.

†Twenty-one plants reporting. Incomplete, one not reporting stocks on hand, and seven not reporting unfilled orders.

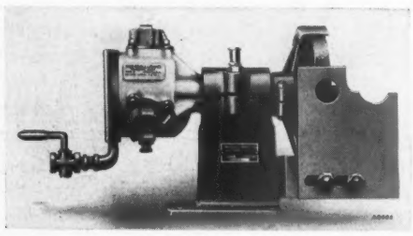
New Machinery and Equipment

Bench-Type Pedestal Grinder

A BENCH-TYPE pedestal grinder, known as the Type 9, which can be bolted to a bench or to a portable air compressor, is being manufactured by Ingersoll-Rand Co., New York City.

The flow of air to the motor is controlled by a hand-operated globe valve. The machine has a free speed of 3000 r.p.m. and is designed to take a vitrified grinding wheel of 6- to 8-in. diameter with a ½-in. face. At the end of the grinder spindle a bit chuck is screwed to take a drill or reamer with ½-in. straight shank.

The motor has three cylinders, spaced



This grinder can be bolted to a bench or portable air compressor

about the center line of the spindle, all delivering power to one crank pin. The three cylinders are interchangeable. The motor operates in a bath of lubricant, so that all moving parts are continuously immersed.

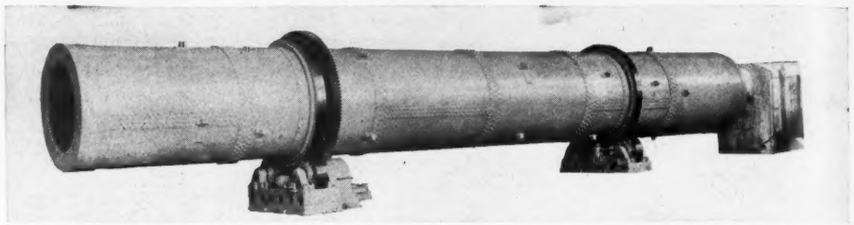
The exhaust is directed through the base of the machine—a feature which prevents the grindings from being blown into the face of the operator. A steady-rest in front of the wheel aids the operator in holding the work.

It is maintained that a grinder of this type proves a very handy machine for grinding or sharpening chisels and picks, squaring up drill steel shanks and taking care of the miscellaneous grinding jobs that are usually encountered. Considerable time can often be saved by having a grinder right on the job to do these tasks as need arises.

Standard equipment includes one 8x1 in. No. 24 Grade Q vitrified wheel for iron and steel grinding and one bit chuck for ½-in. straight shank or reamers. The necessary wrench is also included.

Rotary Dryers and Kilns with Roller Bearings

THE STRUTHERS-WELLS CO., Warren, Penn., has just announced a new line of Timken equipped rotary dryers and kilns. This line includes all sizes from 2-ft. 6-in. diameter to 10-ft. diameter and lengths from 20 ft. to 200 ft. or more, as conditions demand.



The weight of the shell of the dryer is carried on two tires of rolled steel

These units are suitable for use in cement, lime, gypsum, crushed stone and gravel plants, or any industrial plant requiring the drying and the calcining of granular material in bulk. They may be supplied for pulverized coal, gas, or oil firing.

The shell consists of heavy plate sections riveted or welded together and butt-strapped to prevent warping or distortion under load or changes in temperature. The kilns are equipped with lining of refractory material and frequently a shell is provided with both a lined and an unlined section, so that a drying and a calcining operation can be performed in the same shell.

The weight of the shell is carried on two tires or riding rings of rolled steel, the 7-ft. size having an 8-in. face. The tires are mounted so that the expansion of the shell will not affect their relation with the trunnion rollers. Two trunnion rollers, each of 28-in. diameter and 9-in. face, are provided for each tire. The rollers are mounted on a common base of heavy cast semi-steel. Each roller is mounted on a dead shaft, carried in pedestals, the Timken bearings being mounted in the roller hub. The pedestals can be adjusted in four directions to compensate for any inaccuracies in leveling of the base foundations during installation. Individual adjustment is provided for each pedestal.

The 40-ft. kilns are driven by 15-hp. variable-speed, wound-rotor induction motors, through a Timken equipped Farrel-Sykes herringbone gear reduction unit. The driving pinion of the gear reduction unit meshes with a large ring gear on the shell. According to the manufacturer, the arrangement gives a total speed reduction ratio of 50 to 1, resulting in a maximum kiln speed of 4 r.p.m., the normal kiln speed being 2 r.p.m.

Unit for Speeding Up Loading and Unloading of Trucks

A NEW UNIT WHICH it is claimed increases truck efficiency by reducing loading and unloading time, is announced by the Griswold Powermatic Corp., Detroit, Mich.

The unit operates directly from a conventional transmission power take-off without the necessity of the driver leaving his seat. It is claimed that it is capable of loading 5 tons and unloading 7 tons with ease, and is adaptable to all makes of trucks. Quick acting jacks at the rear of the truck frame relieve the truck axle of all unloading strains.

To operate, a lever in the truck cab is moved to engage the power unit. The truck engine furnishes power. The body moves backward, and as this movement continues, the rear edge of the truck body is lowered slowly to the ground while the front is elevated. As the load touches the ground, or loading dock, the truck is slowly driven a short distance forward.

As shown by the illustration, there is no dumping—instead, the load is laid down, it is claimed without jar or break-

New unit for speeding up loading and unloading is adaptable to all makes of trucks

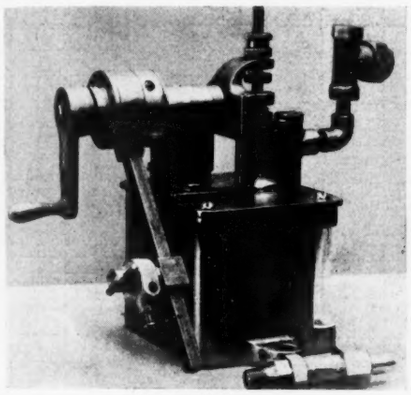
age. A typical performance of the unit is placing 84 bags of cement on the ground in 65 seconds, it is said.

By reversing this action the loading of heavy or bulky machinery, crates, boxes, steel beams and the like is facilitated. With the aid of a winch mounted at the forward end of the truck body the loading and unloading of heavy machinery is reduced to a one-man operation.

Improved Lubricators

THE HILLS-McCANNA CO., Chicago, Ill., announces that its lubricators are now obtainable with either the new Kam-Klutch drive or the ratchet type of driving mechanism.

The manufacturer explains that the Kam-Klutch mechanism comprises a



Improved lubricator has new type of drive

right-hand part which attaches to the standard for the purpose of holding the crankshaft when on the back stroke, and a left-hand part which attaches to the driving rod operating the crankshaft on the forward stroke, and that the principle of the Kam-Klutch is spring held rollers embodied in a housing which work with and against the crankshaft when operating.

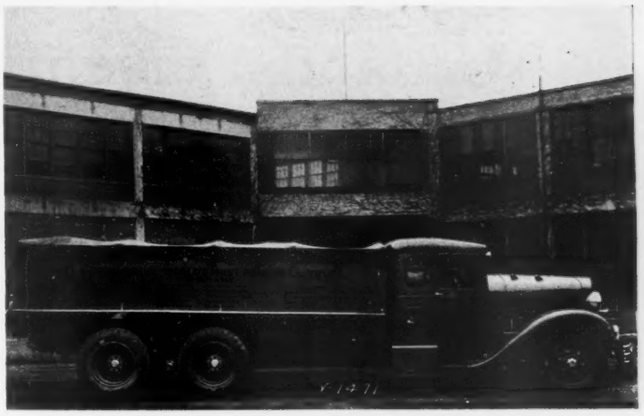
It is claimed that the drive permits attachment to high speed driving arms in any position within the arc of a complete circle, and likewise gives the lubricator greater speed in oil delivery when and where needed. The Kam-Klutch is interchangeable with the present ratchet drives.

Another feature which is mentioned as being included in the Kam-Klutch driven types of lubricators is the new style charging arm or crankshaft for flushing cylinders when starting up or to increase flow when lubricator is in operation.

New Six-Wheel Dual-Engine Heavy-Duty Truck

A NEW TYPE of truck which it is claimed introduces for the first time the multi-motor principle as a means of developing power, hauling capacity and speed hitherto considered impossible, is announced by the Relay Motors Corp., Lima, Ohio.

It is a dual-engine, six-wheel, heavy-duty model, and according to the manufacturer will handle double loads in excavation jobs, a capacity of 4 to 6 cu. yd. of wet mixed concrete, or 5000 to 10,000 bricks or tile in a single load.



Dual-engine, six-wheel, heavy-duty truck

The new truck is equipped with two straight 8-cylinder truck type engines with a combined power of 275 b. hp. at 2800 r.p.m. Each engine delivers power to a separate relay rear axle. It is claimed that this idea of having two separate rear driving axles is entirely new in truck construction and overcomes many of the difficulties encountered in the operation of other six-wheel trucks.

The engines may be used in combination, or one at a time. Each engine has its own transmission. An air mechanism shifts the twin transmissions in perfectly synchronized time. One lever will shift both gears when both engines are in use, and two simple movements from the driver's seat connect or disconnect either engine.

The new model is equipped with heavy duty air brakes, with cast brake drums and molded brake blocks on all six wheels, and air connections for trailers. Twin emergency brakes give added safety in stopping.

Recording Color Analyzer

THE GENERAL ELECTRIC CO., Schenectady, N. Y., is marketing a recording color analyzer, a photo-electric device which automatically draws for permanent record the color curve of a sample in the visible spectrum.

So constructed that either solid substances or transparent materials can be analyzed, it is a laboratory instrument best used for the accurate control of the basic materials entering into the manufacture of colored products.

Approximately 3½ minutes are required to obtain a characteristic curve—the period from the time when the pen starts drawing the curve until it is raised after completing the curve.

The power source for the analyzer includes 110-volt, 60-cycle alternating current to supply the power transformer and the flicker motor, and 8-volt direct current for the lamp and filament currents. It is recommended that an 8-volt, 210-ampere-hour storage battery be used.

Since the analyzer is a recording instrument, it does not require the services of an operator with specialized training in optics. As it uses a photo-electric tube, it has ample sensitivity at the violet end of the spectrum, where visual spectro-photometers must always fail because of the low visibility of violet light.

Catalog Issued on Power Drag Scrapers

A DETAILED description of power drag scraper equipment, accompanied by photographs and data showing operating costs of this equipment on all classes of earth-handling work is contained in a new catalog, No. 14, just issued by Sauerman Bros., Inc., Chicago, Ill.

The improved features of Sauerman power drag scraper equipment are described in the book, which presents a pictorial review of the many applications of this excavator-conveyor.

Descriptions of certain installations, representing the most typical drag scraper applications, have been included.

Recording color analyzer

Portland Cement Output in January

THE PORTLAND CEMENT INDUSTRY in January, 1931, produced 6,581,000 bbl., shipped 4,687,000 bbl. from the mills and had in stock at the end of the month 27,777,000 bbl. Production of portland cement in January, 1931, showed a decrease of 22.6% and shipments a decrease of 5.4% as compared with January, 1930. Portland cement stocks at the mills were 2.6% higher than a year ago.

The statistics here presented are compiled from reports for January, received by the U. S. Bureau of Mines from all manufacturing plants except four, for which estimates have been included in lieu of actual returns.

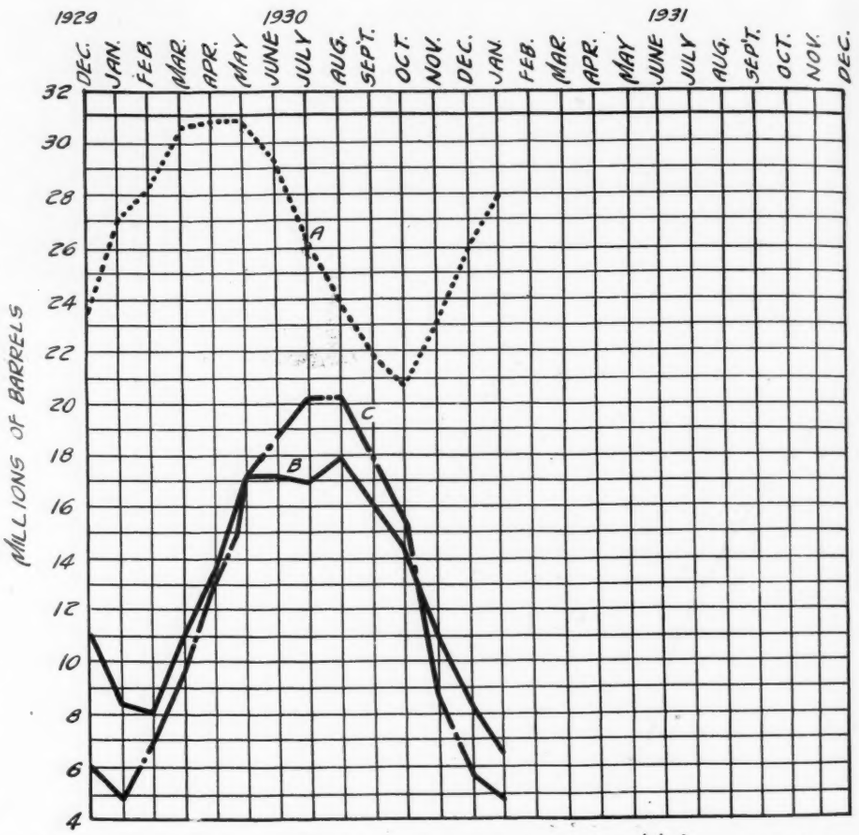
In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants both at the close of January, 1931, and of January, 1930. The estimates include increased capacity due to extensions and improvements during the period.

RELATION OF PRODUCTION TO CAPACITY

	Jan. 1930	Jan. 1931	Dec. 1930	Nov. 1930	Oct. 1930
	Pct.	Pct.	Pct.	Pct.	Pct.
The month	38.8	29.5	38.2	51.7	65.4
12 months ended	65.5	60.6	61.5	62.6	64.2

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during November and December, 1929 and 1930:



(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN NOVEMBER AND DECEMBER, 1929 AND 1930, IN BARRELS*

Shipped to	1929—November	1930	1929—December	1930
Alabama	132,035	67,219	115,961	77,946
Alaska	396	158	962	142
Arizona	43,145	31,593	46,831	30,171
Arkansas	133,371	89,411	84,761	63,553
California	943,641	666,196	728,509	704,699
Colorado	32,910	41,748	32,359	19,474
Connecticut	178,005	113,957	62,419	68,997
Delaware	28,275	17,889	11,737	12,883
District of Columbia	99,047	84,931	44,485	59,861
Florida	111,127	74,271	84,792	60,233
Georgia	121,871	103,952	101,776	86,898
Hawaii	26,788	17,979	19,772	19,770
Idaho	17,468	13,538	6,642	4,829
Illinois	782,779	655,302	263,469	247,845
Indiana	326,534	160,458	108,261	80,190
Iowa	127,446	98,047	35,737	40,965
Kansas	159,803	153,458	105,763	78,186
Kentucky	107,310	102,299	46,660	54,631
Louisiana	152,054	133,845	171,845	130,600
Maine	52,865	53,127	19,014	26,759
Maryland	233,983	119,436	79,751	84,223
Massachusetts	225,482	248,481	101,340	153,583
Michigan	588,511	407,866	224,563	194,610
Minnesota	130,411	89,729	52,991	64,412
Mississippi	71,069	34,044	64,336	32,986
Missouri	396,019	413,025	142,398	188,762
Montana	16,035	20,597	8,041	9,612
Nebraska	61,548	68,717	33,088	21,890
Nevada	8,173	6,681	8,279	1,916
New Hampshire	37,526	24,958	13,915	12,673
New Jersey	678,291	403,664	281,867	259,936
New Mexico	15,557	17,445	10,437	12,929
New York	1,441,207	1,233,534	722,146	867,187
North Carolina	110,928	63,911	66,152	42,274
North Dakota	9,564	7,734	2,161	2,352
Ohio	638,120	614,013	253,060	238,538
Oklahoma	261,283	195,644	213,739	135,784
Oregon	78,363	87,098	49,698	53,936
Pennsylvania	1,022,410	517,568	435,580	431,241
Porto Rico	3,520	125	4,500	6,918
Rhode Island	58,690	34,865	24,096	20,270
South Carolina	70,756	177,632	67,813	132,992
South Dakota	22,438	17,948	12,744	7,187
Tennessee	228,476	117,871	136,191	74,077
Texas	475,332	454,199	428,688	339,964
Utah	37,616	21,142	23,560	4,271
Vermont	43,012	21,939	17,560	2,678
Virginia	120,589	102,029	68,406	77,370
Washington	158,675	262,159	101,062	185,135
West Virginia	103,156	105,304	50,471	56,245
Wisconsin	224,480	157,633	80,278	62,793
Wyoming	9,346	8,763	6,690	3,028
Unspecified	.....	13,633	.....	427
	11,157,436	8,748,765	5,877,356	5,650,831
Foreign countries	64,564	35,235	73,644	37,169
Total shipped from cement plants	11,222,000	8,784,000	5,951,000	5,688,000

*Includes estimated distribution of shipments from three plants in November and December, 1929; from two plants in November and December, 1930.

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1930 AND 1931, IN BARRELS

Month	1930—Production	1931	Stocks at end of month 1930	1931
January	10,504,000	8,129,000	9,646,000	10,400,000
February	10,008,000	.....	11,572,000	.....
March	13,045,000	.....	13,503,000	.....
April	15,025,000	.....	15,164,000	.....
May	16,607,000	.....	14,668,000	.....
June	15,895,000	.....	13,452,000	.....
July	15,069,000	.....	11,684,000	.....
August	15,244,000	.....	9,275,000	.....
September	14,577,000	.....	7,783,000	.....
October	13,895,000	.....	7,266,000	.....
November	11,639,000	.....	7,758,000	.....
December	*9,484,000	.....	*8,809,000	.....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN JANUARY, 1930 AND 1931, AND STOCKS IN DECEMBER, 1930, IN BARRELS

District	Production 1930—Jan.—1931		Shipments 1930—Jan.—1931		Stocks at end of month 1930	1931	Stocks at end of Dec., 1930*
Eastern Penn., N. J., Md.	2,286,000	1,617,000	1,388,000	1,084,000	6,075,000	5,546,000	5,014,000
New York and Maine	320,000	420,000	249,000	206,000	1,615,000	1,988,000	1,775,000
Ohio, Western Penn., W. Va.	727,000	505,000	472,000	367,000	3,289,000	3,710,000	3,572,000
Michigan	346,000	45,000	234,000	220,000	2,509,000	2,915,000	3,090,000
Wis., Ill., Ind. and Ky.	1,377,000	804,000	327,000	354,000	3,926,000	3,955,000	3,505,000
Va., Tenn., Ala., Ga., Fla., La.	842,000	646,000	730,000	679,000	1,753,000	1,766,000	1,799,000
East'n Mo., Ia., Minn., S. D.	758,000	854,000	214,000	288,000	3,140,000	3,069,000	2,503,000
Western Mo., Neb., Kansas, Okla. and Ark.	701,000	450,000	271,000	321,000	1,889,000	2,218,000	2,089,000
Texas	321,000	322,000	317,000	340,000	817,000	782,000	799,000
Colo., Mont., Utah, Wyo., Ida.	.....	123,000	42,000	50,000	415,000	410,000	337,000
California	718,000	624,000	640,000	643,000	1,168,000	858,000	876,000
Oregon and Washington	102,000	171,000	71,000	135,000	485,000	560,000	524,000
	8,498,000	6,581,000	4,955,000	4,687,000	27,081,000	27,777,000	25,883,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1930 AND 1931, IN BARRELS

Month	1930—Production—1931		1930—Shipments—1931		Stocks at end of month 1930	1931
January	8,498,000	6,581,000	4,955,000	4,687,000	27,081,000	27,777,000
February	8,162,000	.....	7,012,000	.....	28,249,000	.....
March	11,225,000	.....	8,826,000	.....	30,648,000	.....
April	13,521,000	.....	13,340,000	.....	30,867,000	.....
May	17,249,000	.....	17,224,000	.....	30,891,000	.....
June	17,239,000	.....	18,781,000	.....	29,364,000	.....
July	17,078,000	.....	20,153,000	.....	26,289,000	.....
August	17,821,000	.....	20,299,000	.....	23,824,000	.....
September	16,124,000	.....	18,083,000	.....	21,889,000	.....
October	14,410,000	.....	15,599,000	.....	20,697,000	.....
November	11,098,000	.....	8,784,000	.....	23,056,000	.....
December	8,480,000	.....	5,688,000	.....	*25,883,000	.....
	160,905,000	.....	158,744,000	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT), BY DISTRICTS, IN JANUARY, 1930 AND 1931, IN BARRELS

District	1930—Production—1931		Stocks at end of month 1930	1931
Eastern, Pennsylvania, New Jersey and Maryland	2,546,000	1,878,000	1,356,000	1,329,000
New York and Maine	525,000	659,000	813,000	902,000
Ohio, Western Pennsylvania and West Virginia	999,000	723,000	1,212,000	1,290,000
Michigan	868,000	445,000	1,152,000	1,271,000
Wisconsin, Illinois, Indiana and Kentucky	1,586,000	1,000,000	858,000	1,091,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	901,000	587,000	732,000	966,000
Eastern Missouri, Iowa, Minnesota and South Dakota	790,000	989,000	575,000	584,000
Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas	805,000	550,000	290,000	666,000
Texas	400,000	315,000	563,000	339,000
Colorado, Montana, Utah, Wyoming and Idaho	11,000	128,000	254,000	276,000
California	926,000	686,000	1,315,000	1,177,000
Oregon and Washington	147,000	259,000	526,000	509,000
	10,504,000	8,129,000	9,646,000	10,400,000

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1929 AND 1930

Month	1929—Exports		1930—Exports		1929—Imports		1930—Imports	
	Barrels	Value	Barrels	Value	Barrels	Value	Barrels	Value
January	78,639	$283,002	82,387	$293,135	151,302	$177,976	201,609	$207,461
February	58,886	225,590	64,267	217,798	118,930	123,123	114,455	119,717
March	69,079	235,164	117,563	357,896	131,909	112,788	43,622	59,981
April	64,145	218,316	57,419	200,217	89,668	114,281	140,871	178,226
May	57,955	219,366	57,423	198,170	200,646	267,854	94,696	111,998
June	96,055	287,612	82,077	223,639	203,545	228,170	55,356	74,370
July	71,992	247,177	47,082	166,577	182,098	199,960	12,404	20,973
August	60,013	225,762	49,031	167,579	183,938	199,403	35,323	39,029
September	86,268	308,631	46,594	153,384	112,372	152,239	51,096	59,721
October	101,359	337,839	62,690	190,305	172,566	187,504	75,284	84,364
November	53,378	198,197	50,495	151,555	96,568	95,844	109,124	125,448
December	88,403	297,255	38,680	134,260	84,358	79,098	44,157	59,641
	886,172	$3,083,911	755,708	$2,454,515	1,727,900	$1,938,240	977,997	$1,140,929

Exports and Imports†*

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES, IN DECEMBER, 1930

Exported to	Barrels	Value
Canada	2,021	$ 8,728
Central America	7,248	16,652
Cuba	3,632	9,740
Other West Indies and Bermuda	2,815	5,501
Mexico	3,871	12,562
South America	15,660	62,322
Other countries	3,433	18,755
	38,680	$134,260

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN DECEMBER, 1930

Imported from	District into which imported	Barrels	Value
Belgium	New York	12,580	$11,779
	Porto Rico	1,319	1,676
	Total	13,899	$13,455
Canada	Maine and N. H.	22	$ 101
	Porto Rico	3,036	3,397
	Total	3,058	$ 3,498
Denmark	Porto Rico	15,382	$23,926
France	Massachusetts	862	$ 2,087
Germany	Los Angeles	2,517	$ 4,993
Italy	New York	1	$ 2
Japan	Hawaii	7,425	9,786
	Los Angeles	1	4
	Total	7,426	$ 9,790
United K'gd'm.	New York	1,012	$ 1,890
	Grand total	44,157	$59,641

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII AND PORTO RICO, IN DECEMBER, 1930

	Barrels	Value
Alaska	305	$ 597
Hawaii	24,541	60,117
Porto Rico	1,233	2,318
	26,079	$63,032

*The value of exports of domestic cement is the actual cost at the time of exportation in the ports of the United States whence they are exported, as declared by the shippers on the export declarations.

†The value of imported cement represents the foreign market value at the time of exportation to the United States.

Building Material Prices

THE figures given below, compiled by the Department of Commerce, show average prices paid by contractors, delivered.

Average Retail Prices for Rock Products Materials, January 1, 1931

City	Portland cement, per bbl. exclu. of cont.	Gypsum wallboard, ⅜ in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.90	.....	$20.00	$1.25	$2.25	.....
New London, Conn.	2.90	$25.00	26.00	1.50	3.00	$18.00
Waterbury, Conn.	3.00	30.00	20.00	1.35	2.45	20.00
Haverhill, Mass.	2.80	25.00	20.00	.....	.....	18.50
New Bedford, Mass.	2.60	27.00	18.50	1.75	3.00	17.50
Albany, N. Y.	2.97	24.75	18.00	.....	.....	17.10
Buffalo, N. Y.	2.95	21.00	18.00	1.85	2.05	16.00
Poughkeepsie, N. Y.	2.18	.....	.....	2.25	2.00	.....
Rochester, N. Y.	3.25	22.00	20.00	1.75	2.40	17.00
Syracuse, N. Y.	3.00	22.50	18.00	2.00	2.25	17.00
Paterson, N. J.	2.40	25.00	18.00	1.50	2.10	17.50
Trenton, N. J.	2.40	26.00	18.00	1.50	2.10	17.50
Philadelphia, Penn.	2.30	.....	14.50	1.75	2.60	17.50
Scranton, Penn.	2.80	.....	20.00	3.25	.....	19.00
Baltimore, Md.	2.53	.....	13.00	2.50	2.75	16.00
Washington, D. C.	2.50	25.00	13.00	.....	.....	16.00
Richmond, Va.	3.10	31.00	17.50	1.95	2.45	20.00
Fairmont, W. Va.	2.80	.....	16.00	3.15	3.50	18.00
Columbia, S. C.	2.73	30.00	13.50	2.00	2.75	15.50
Atlanta, Ga.	2.38	.....	17.50	1.85	2.30	16.50
Savannah, Ga.	2.25	25.00	20.00	1.75	.....	16.00
Tampa, Fla.	3.00	.....	24.00	2.00	4.50	.....
New Orleans, La.	2.20	.....	.....	2.35	.....	18.00
Shreveport, La.	3.20	.....	.....	2.00	4.75	22.00
Erie, Penn.	2.40	22.50	18.00	2.00	.....	16.00
Akron, Ohio	2.67	.....	18.00	1.85	2.75	.....
Canton, Ohio	2.95	.....	16.00	2.50	3.00	15.00
Cincinnati, Ohio	$2.94	$24.75	$16.40	$2.63	$2.55	.....
Cleveland, Ohio	2.40	.....	12.00	1.95	2.70	14.50
Columbus, Ohio	2.70	.....	14.00	.....	2.25	15.00
Toledo, Ohio	3.00	20.00	12.00	2.00	2.50	14.50
Youngstown, Ohio	2.60	.....	15.00	3.40	2.50	15.00
Detroit, Mich.	2.60	25.00	14.80	1.50	1.95	.....
Lansing, Mich.	2.90	.....	22.00	2.20	.....	16.50
Saginaw, Mich.	2.60	25.00	18.00	2.50	3.25	17.00
Terre Haute, Ind.	2.85	28.00	18.00	1.65	2.25	18.00
Louisville, Ky.	2.52	.....	15.50	2.20	2.43	16.00
Chicago, Ill.	2.40	21.00	17.00	2.00	2.00	16.00
Milwaukee, Wis.	2.32	25.00	15.00	1.50	1.50	.....
Des Moines, Iowa	3.08	.....	20.00	1.10	.....	.....
Kansas City, Mo.	2.50	25.00	24.00	1.70	2.25	17.00
St. Louis, Mo.	2.15	.....	18.00	1.35	1.00	18.00
St. Paul, Minn.	2.45	.....	18.00	2.23	1.75	18.00
Grand Forks, N. D.	3.00	.....	25.00	2.60	.....	20.00
Sioux Falls, S. D.	3.00	.....	24.00	1.25	2.25	15.00
San Antonio, Texas	2.60	.....	20.00	2.10	2.35	19.15
Tucson, Ariz.	3.37	36.00	30.00	1.25	2.25	17.10
Denver, Colo.	2.20	35.00	22.00	1.10	1.40	18.00
Los Angeles, Calif.	2.30	.....	22.00	1.85	1.90	15.20
San Francisco, Calif.	2.60	.....	22.50	1.40	1.60	19.90
Portland, Ore.	2.60	30.00	23.00	1.50	1.50	18.00
Seattle, Wash.	1.75	.....	22.00	1.40	.....	20.00

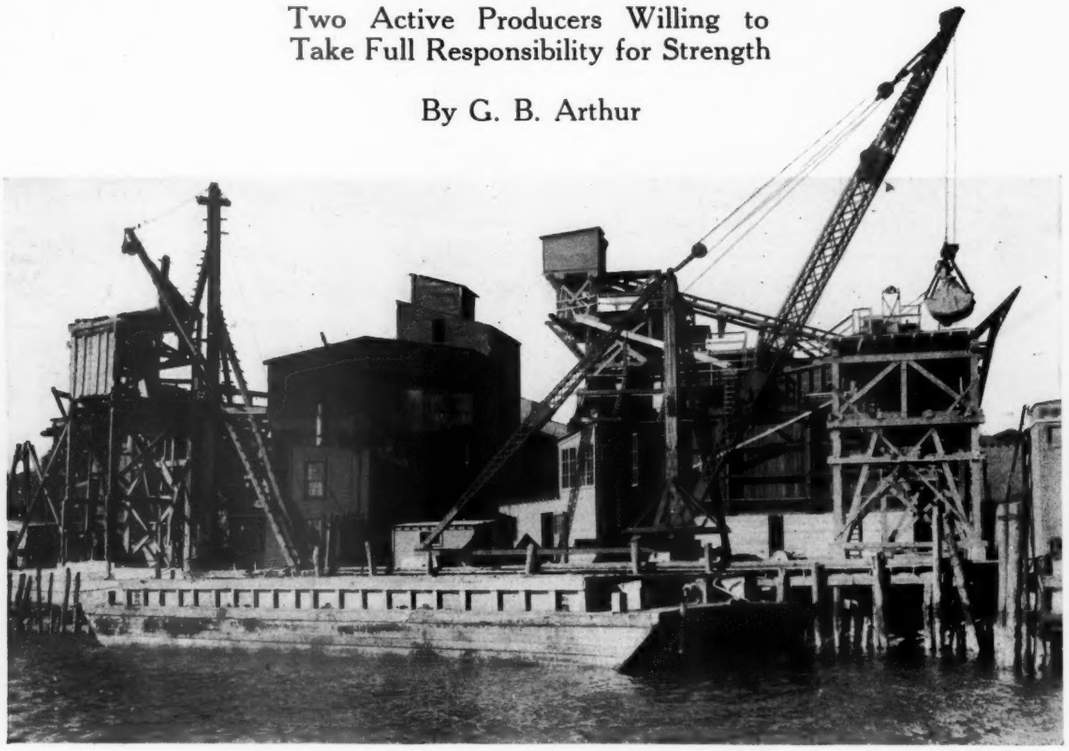
Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Pre-Mixed Concrete in Washington, D. C.

Two Active Producers Willing to Take Full Responsibility for Strength

By G. B. Arthur



Unloading facilities on Potomac River at plant of Super Concrete Corp.

THE TREND toward fixed responsibility for the quality of concrete is marked in Washington, D. C., by the desire of the two companies manufacturing ready-mixed concrete in that city to sell on a basis of guaranteed strength.

Formerly there were three producers here, but the Pre-Mix Concrete Corp., at 3121 K Street, N. W., was acquired by the Maloney Paving Co. in June. The K street plant of the Pre-Mix organization is not in service, but its other plant, at 15th and H streets, N. E., is operated as the second unit of the Maloney Paving Co. This company's original plant is at 3117 K street, N. W. Both plants are now operated on the transit-mixed system.

Chas. P. Maloney, president, is secretary of the National Association of Paris Transit-Mixed Concrete Manufacturers, and is active in all efforts to make pre-mixing the standard practice.

Recently the Maloney Paving Co. was able to obtain the approval of the supervising architect of the treasury for transit-mixed concrete on the new Marine Barracks hospital in San Francisco.

The other producer in Washington is the Super Concrete Corp., at 3046 K Street, almost across the street from the original plant of its competitor. This is a ready-mixed plant of such excellent design and operating methods as to establish it securely in the field. Some of the literature states that the investment is $300,000, and commercial appraisers have recently placed the present value at practically that figure.

This plant was built by the Graham brothers, of Richmond, Virginia, but recently there has been a stock transfer by which two of the Graham brothers left the company to engage in contracting in Washington. This plant has operated continuously for over two years.

Agreeing on all of the essentials in promoting and selling pre-mixed concrete, which is their common ground, these two plants are farther apart with respect to mixing and transporting their product, and do not agree at all on the extent and nature of producing establishments.

Responsibility for Strength

In one thing which is of vital concern to contractors and the public they speak the same language: that concrete should be sold on a basis of guaranteed strength, not on theoretical or empirical proportions; and they are willing to accept all of the consequences affecting their business. This is a matter of vast importance, touching the future to an extent which overshadows all present considerations.

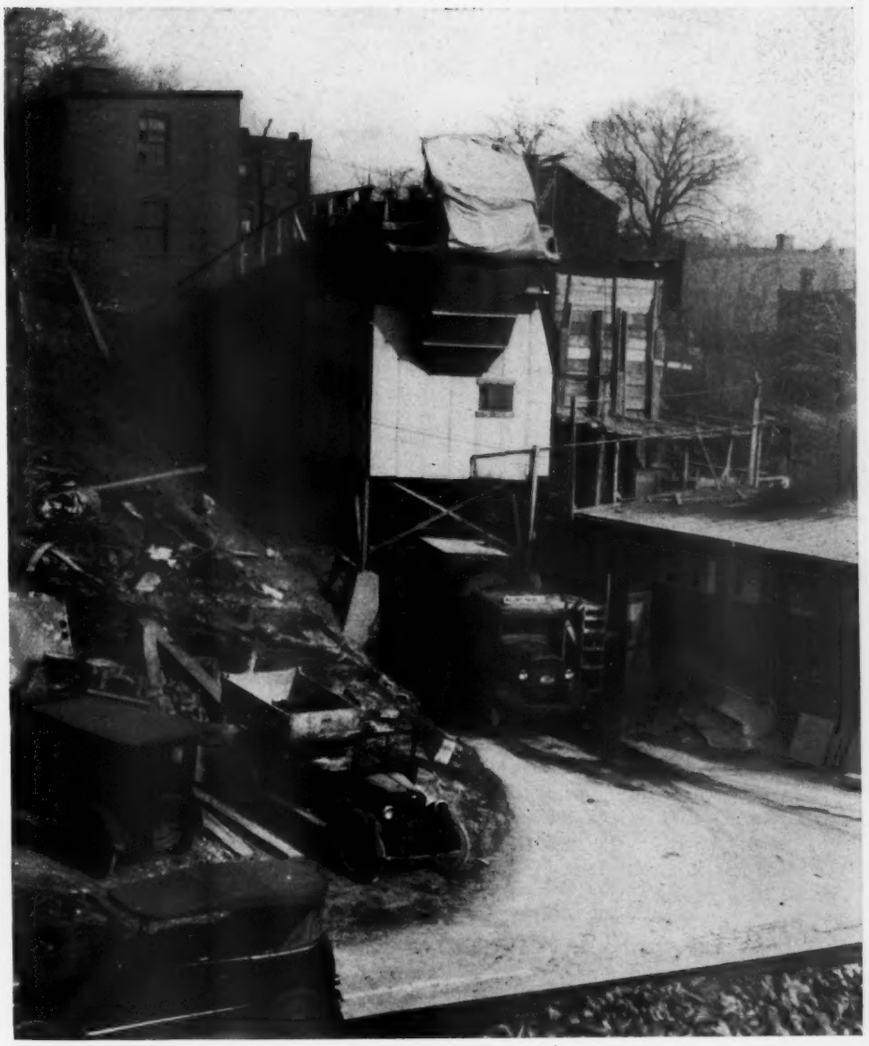
Mr. Maloney thinks that all details of producing pre-mixed concrete should be under the constant control of a certified commercial testing laboratory, and that this control should be required to produce concrete of uniform, proven strength. He says that only by such a method can the production of concrete be put on a rational basis.

The experience of this company is that it can usually meet the requirements of a job calling for 1:2:4 concrete with its 1:3:6 product, and that transit-mixed concrete rated as 1:2:4 usually goes well over 3000 lb. in compression tests at 28 days.

The Super Concrete Corp. is just as emphatic in condemning empirical systems of specifying concrete. John L. Harrison, manager of sales, remarked that these systems have concentrated the attention of construction people upon tables of proportions, ratios and moduli, when they need be concerned only with the reliability of a company which guarantees its concrete to meet the requirements of specifications.

This corporation has made tests from time to time, and has used graphs and tables to present the information returned from the laboratories; but it realizes that some resistance has grown up through the period of transition from poor practices to better ones, poor practices due to lack of responsibility, lack of accurate knowledge, and lack of adequate facilities; a resistance derived from the timidity occasioned by failures to get good concrete when using tables of proportions and other accepted methods.

The many advantages of pre-mixed concrete which are legitimately put forward by the producers cannot be included in this article, but this one feature, that they prefer to sell with a guarantee of strength—their willingness to stand or fall upon that assumption of responsibility—should turn the attention of every construction official to their vigorous and healthy growth in many cities.



K Street plant of Maloney Paving Co. Trucks reach top of bins from upper street

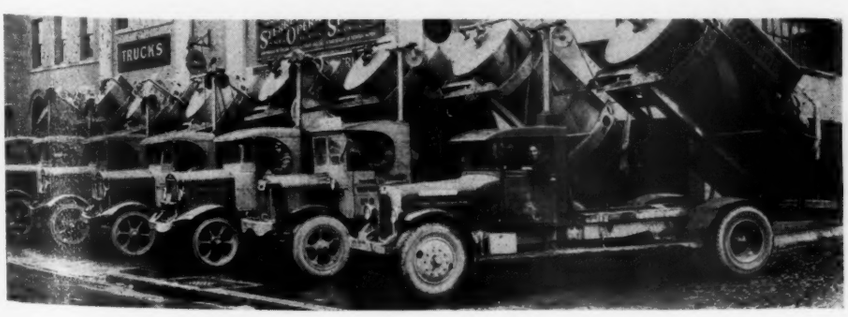
Output Is Approved by Officials

These two Washington plants co-operate wherever their interests touch, and these points of similarity will be discussed before presenting the characteristics of their establishments. Formerly the District of Columbia allowed a maximum of only 30 min. for agitating after mixing, but that is now changed to 1 hour. The output has been accepted by every construction agency of the government, and both the district and federal officials keep informed by careful tests made at specified intervals. The tendency is toward more confident acceptance of the product on all jobs.

For cold weather work the code of the District of Columbia provides that concrete shall be between 40 and 120 deg. F., when placed, and that this may be accomplished by heating the aggregates or the mixing water or both. Also, that ready-mixed concrete shall be delivered to the forms at not less than 50 deg. in freezing weather. The Super Concrete Corp. heats the mixing water to 180-200 deg. The Maloney Paving Co. heats the aggregates at the K Street plant; but at the other plant, formerly operated by the Pre-Mix Concrete Corp., at 15th and H streets, N. E., the mixing water is heated. Both plants deliver concrete above 65 deg., and their jobs set up rapidly through the coldest weather.

Both plants use admixtures when required, and add the cost of the admixture to the price of the concrete. Though they named a number of materials which they have used, hydrated lime is more in evidence than any other. Both ways of mixing get the maximum benefit from lime because of the continued and thorough mixing.

Other special mixtures are handled without difficulty. The Super Concrete Corp. uses Incor cement to a very considerable extent. R. F. Knox, sales engineer for the Maloney Paving Co., remarked that they have been one of the largest users of Incor cement in this section, and sell it at $2.50 above the cost of plain concrete.

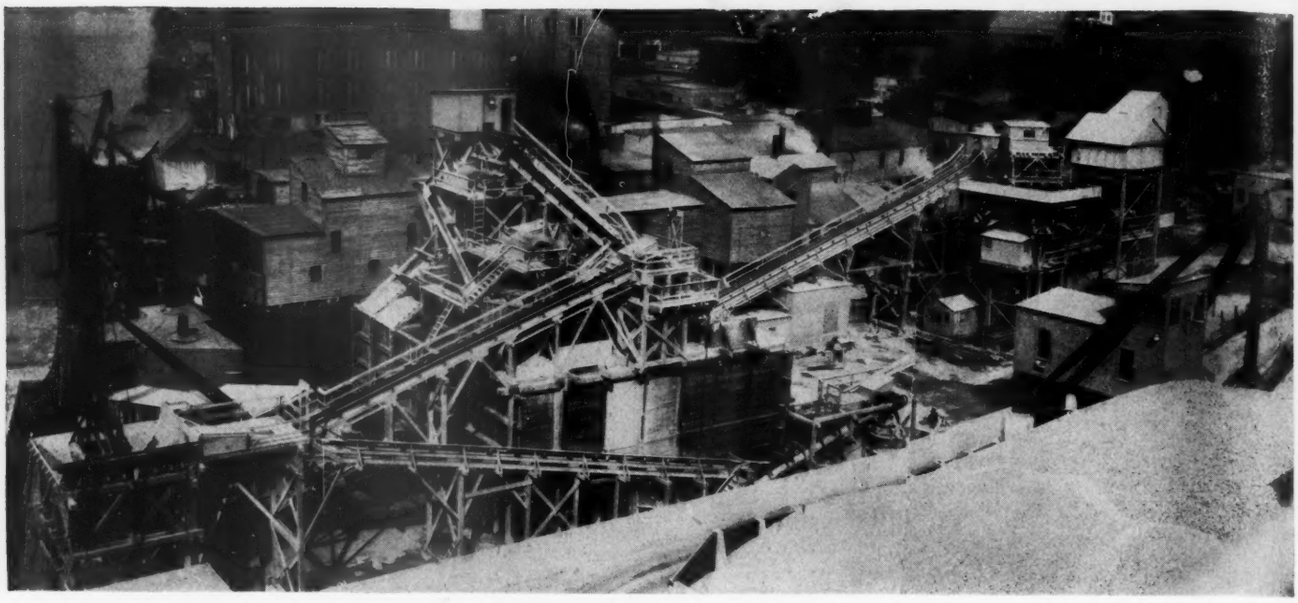


Part of the Maloney fleet of transit mixers

Mixing and Trucking to the Job

The methods of these two concerns in mixing their concrete and trucking it to the job are not as radically different as might be supposed.

The Super Concrete Corp. loads its agi-



General view of plant of Super Concrete Corp., Washington, D. C.

tator trucks with concrete which has been mixed for 1½ min., after the water and all materials are charged. The truck makes a quick run to the job and discharges into a hopper, into forms, or on to a subgrade for sidewalk or street paving. The truck will stand at the job and agitate the concrete for an hour at no extra charge if the job is not ready for it.

The Maloney Paving Co. loads its transit system trucks with dry materials. The mixer body is turning as they enter, and this mixing is continued for 1½ min. after all materials are charged. The water can be added here, and the mixing done while en route to the job—which would actually be transit mixing, but this is not the usual practice. The rule is to haul the dry-mixed batch to the job, add the water there, and continue the mixing for 3 or 4 min.

Selling Practice

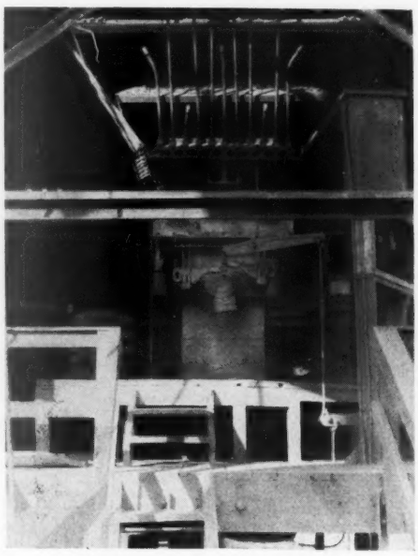
Both plants are active in selling or promoting if that term is preferred and they contract for all of the concrete on a job. A bid and acceptance form is used, which puts the contract on a business basis. From the beginning all contracts have carried a guarantee.

The Super Concrete Corp. makes a distinction between routine business over the telephone and that which is actively solicited, and leans strongly toward actual selling, job by job. It is interesting to learn that 30% of their orders come over the telephone without solicitation, but that these represent only 5% of their volume.

About 75% of the big jobs in the District and nearby Virginia are being sold by these two companies, excepting the very large government buildings in the Triangle. These government contracts are not desirable, for they are so large that they would take the combined output of both plants and would upset them for all other business.

Another interesting discovery is that the Super Concrete Corp. tries to sell the active small contractors, and has a well-planned follow-up with letters and literature for this class of prospects, believing that any legitimate business is grist for the mill, and that the steady daily orders from these small consumers will carry a certain amount of overhead with no selling cost. In selling the small contractor the argument veers from quality to cost, and it is necessary to prove that the pre-mixed product is cheaper for him than his own.

Prices for the different mixtures increase by zones which are drawn as concentric circles one mile apart. Since the two most active plants are almost opposite each other on K Street in the northwestern section of the city their zones are the same, and this location serves most of the work in the District. The other plant of the Maloney Paving Co., in the northeast quarter, cuts into these zones with its one-mile circles, and since this company uses its two plants interchangeably for best service there is some complication in these overlapping areas.



Weighing platform under cement bins

However, this matter of zoning, which often upsets a market when plants are at widely separated locations, is not so difficult in Washington, because the two principal plants are so close together and the other is controlled by one of these two.

The price list of the Maloney Paving Co. shows an advance of 30c for each zone. The Super Concrete Corp. is preparing a new price list in which the increase will be only 20c for each zone.

Plant of the Super Concrete Corp.

This is one of the few pre-mixing plants in the country which unload, wash, screen and grade their aggregates, and it has a most efficient plant for the purpose. For convenience in comparing it with similar plants it will be divided into two parts for discussion: the first part devoted to unloading and finishing aggregates—operations not found in many pre-mixing plants; and the second part consisting of bins for receiving finished aggregates, the mixing, and charging the agitator trucks.

All aggregates are purchased from the Columbia Sand and Gravel Co. or the Smoot Sand and Gravel Co., both of which plants adjoin that of the Super Concrete Corp., and front on the Potomac River. Both of these companies have dredging operations on the river not over 10 miles away, and they tow 250- to 300-ton barges of sand and gravel to the dock of the Super Concrete Corp., and the purchaser unloads them with its own facilities. This material is washed but not screened, so the shore unit for handling it is necessarily extensive and complete.

The unloading is done with a fabricated steel derrick having a 70-ft. boom, equipped with a 2-yd. Blaw-Knox clamshell bucket, and a scow is emptied in 1¼ to 1½ hours. The derrick is powered by a three-drum Clyde hoist driven by a 100-hp. General Electric motor. The material is deposited in the shore hopper, which feeds it to an inclined belt conveyor.

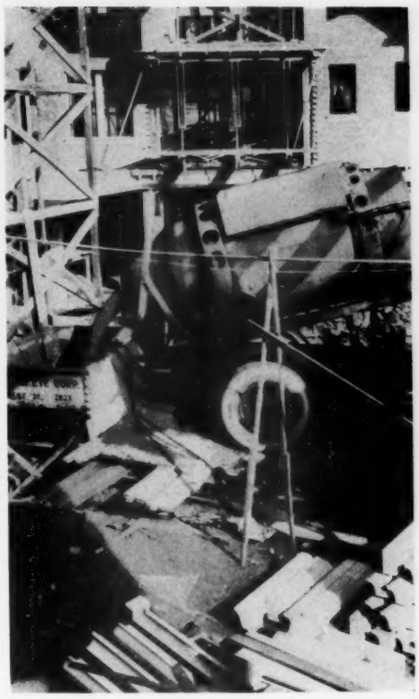
This conveyor is 24 in. wide, on an incline of more than 45 deg., and discharges on to a similar belt which continues the incline at right angles to the first belt to reach the head house, which is over 100 ft. above ground. When the gravel begins to descend from this point it meets a stream of water for its second washing as it goes through four Gilbert truncated-cone screens with double jackets. Over-size material is chuted and conveyed to a Nordberg gyratory crusher, from which it is sent back on an inclined belt conveyor to re-enter the main stream at the derrick hopper. The sand screened out in the Gilbert revolving screens goes through two classifiers for dewatering. Four sizes of gravel are graded out, as follows:

Number	1	2	3	4
Passing	¾-in.	1¼-in.	1¾-in.	2½-in.
Retained on	¼-in.	¾-in.	1¼-in.	1¾-in.

This finished material is now chuted to five storage bins built in a unit holding 2500 tons.

This may be considered the end of the first part of the plant, for at this point most plants would have some storage for finished aggregates. The plant as a unit is remarkably compact and well engineered, and what seems to be a small space is neatly organized to serve all requirements. The bins and conveyor ways are of timber. All conveyors and accessories were furnished by the Stephens-Adamson Manufacturing Co.

Here at the beginning of the second part of the plant sand and gravel are drawn from



Transit mixer dumping into hopper at foot of contractor's elevator

the five storage bins on three 30-in. horizontal belt conveyors driven by 5-hp. motors, which deliver it to the main conveyor, which runs up an incline to the bins above the mixer. Its burden is turned into the five compartments, which have these capacities:

Number	1	2	3	4	Sand
Capacity, tons	420	370	480	510	610

These varying capacities, designed purposely, give some indication of the demand for different proportions.

The aggregates are weighed on Blaw-Knox automatic scales, and the operator works to instructions received on the Telautograph which stands beside the scales. The sand is first weighed out, and then the gravel is added to make the total weight for aggregates. These aggregates are then dropped into the Ransome 3-cu. yd. mixer.

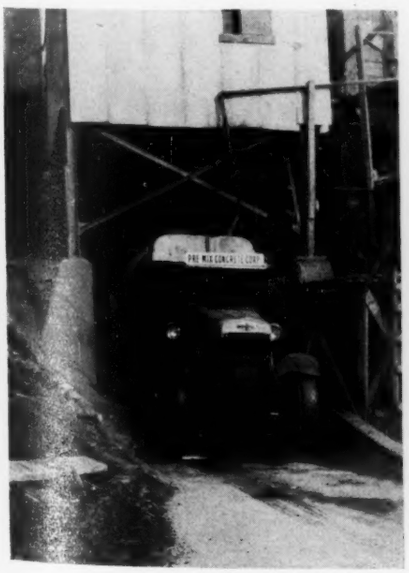
This same man adds the water from a calibrated tank, flowing directly into the mixer. Each standard mix has its scheduled amount of water, but conditions frequently call for some modification of these quantities, or a customer will ask for some change to suit his chuting or placing conditions.

At the same time another man, at the cement scale across a short bridge from the aggregates station, has weighed out the cement, working to the specifications on his Telautograph, and this is carried by a screw conveyor to a point just above the mixer where it joins the aggregates as they are discharged into the mixer.

All cement except Incor comes in bulk, and is hauled in ordinary trucks from the cars to the receiving hopper, which is housed in except for the front. This hopper feeds a screw conveyor which takes the cement across to the boot of the vertical elevator at the right of the receiving hopper. This elevator lifts it to the 1800-bbl. storage bin which stands at about the same elevation as the aggregates bin. Both of the compartments in this bin are piped for compressed air to prevent arching.

This end of the plant is powered by General Electric motors, all controlled from the weighing station under the aggregates bin. The 3-yd. mixer is driven by a 60-hp. motor, the cement elevator by one of 15 hp., the motor on the cross screw conveyor from the cement receiving hopper to the boot of the elevator is 5-hp., the screw conveyor from the cement bin to the mixer has a 5-hp. motor, and the air compressor is driven with another of 5 hp.

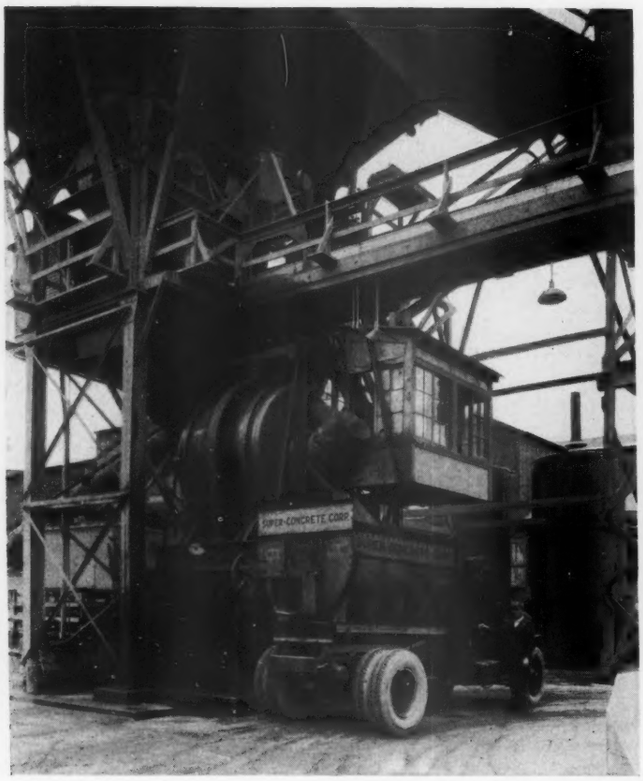
As stated before the batch is mixed for 1½ min. after all materials are in the mixer.

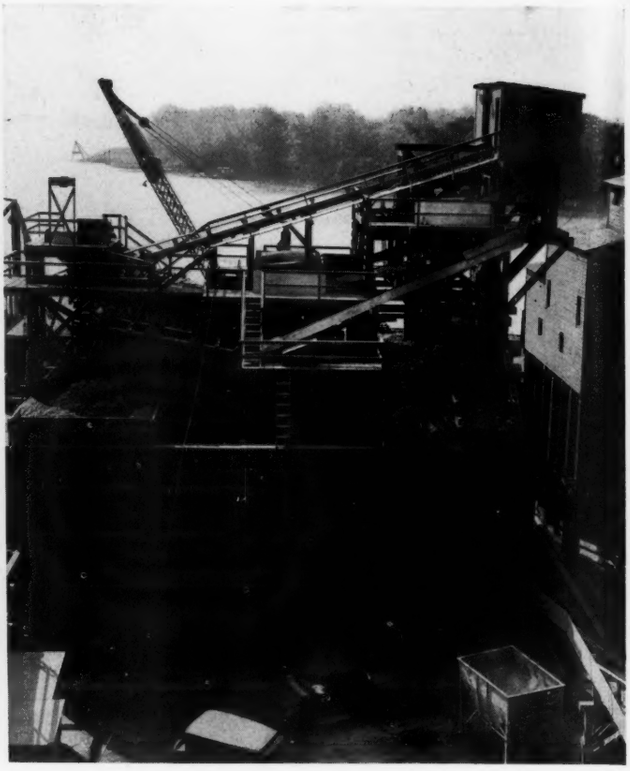


Top loading

The two discharge chutes

End loading





Mixing and screening sections of plant of Super Concrete Corp.

It is discharged into the trucks, which stand parallel to the street for loading, having come in on the entrance side of the yard, and which now proceed on the exit side to the street. They stop under the mixer for about a half minute, and while the batch is being charged into the agitator drum the driver is getting his delivery slips. The time between trucks is about two minutes, which is roughly divided into thirds: getting into position, receiving the load, and getting away.

By means of the Telautograph the office gives instructions simultaneously to both of the two men at the scales, and the stream of incoming trucks is in full view from the windows, so that all operations are under perfect control by P. T. Graham, the truck despatcher.

The fleet of trucks is owned by the Super Concrete Corp., and consists of thirteen 3-yd. agitator drums on Mack bodies, and five 6-yd. drums on Corbitt bodies. Power for these agitator drums is taken from the truck transmission, and about 12 hp. is required.

The performance of these trucks is a factor of importance in maintaining the output of the plant. John Redd, manager of the plant, states that they will travel about 20 miles an hour, loaded, and cited some interesting jobs where pouring had to be done continuously. On the Post Office in Alexandria, Va., which is 12 miles away, the trucks arrived 33 min. after leaving the plant on K Street, and at one stage of the job they delivered 140 yd. in half a day.

The capacity of the plant is unbalanced at present, for the rear portion which is devoted to the finishing of aggregates has doubled the capacity of the front half. So the capacity of the front part is to be doubled this winter, and more trucks are to be added to the fleet. The plant is rated at 60 yd. an hour, but this has been increased to 75 at times. They have put out 825 yd. in one day without working a night shift. Flood lights all over the plant are ready for night work, so that the real output of the plant is very much a matter of demand. Fifteen men are employed, which includes those working in the office.

Bins of Massaponax Sand and Gravel Co.

Plant of the Maloney Paving Co.

The difference between plant-mixing and transit-mixing leads naturally to a different plant set-up for the Maloney Paving Co. Causing still more contrast is the absence of storage bins at both plants.

As Mr. Maloney pointed out, their transit system trucks can pull under the hoppers of any aggregate producer and load up. Cement can be added from any stock, and the water can be obtained at any hydrant. This is

Weighing batchers under Massaponax bins

literally the fact at the Northeast plant where the company has such a working arrangement with the Massaponax Sand and Gravel Co. Here are five elevated steel bins holding 350 tons each, with batch weighing units attached at the bottom. The bin for cement stores 1500 bbl.

The batch weighing units handle 800 lb. of cement, a ton of gravel, and 1500 lb. of sand. They are automatic, and are suspended high out of danger of collision with any part of a truck.

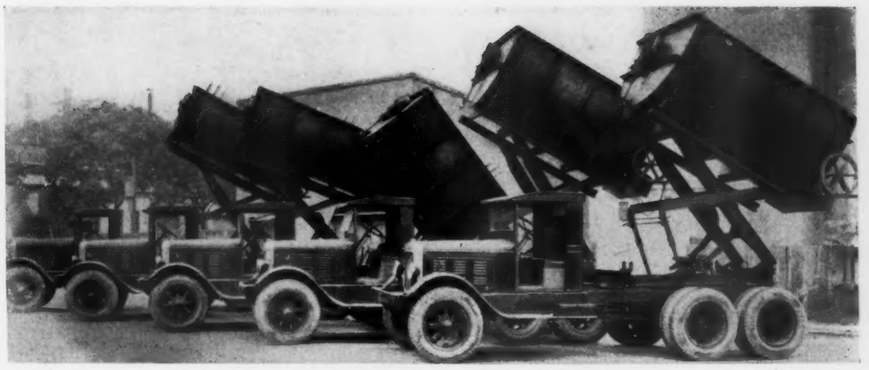
Loading

Only top-loading is done here. A truck coming in drives under the line of bins at the far end, heading toward the office. Water is taken on at the farthest stop. Then the truck moves up to the gravel bins for the weighed amount. Next is the cement bin where the batch unit delivers the specified amount. The last stop is at the sand bin, alongside the office, and while the sand is being dumped the driver gets his delivery slip and instructions. This operation may seem to be slow, but P. H. Lynn, the superintendent of operations for the Maloney Paving Co., said that it requires less than 5 min. to load a truck and get it away.

Both the aggregates and the water are heated here. Live steam at 15 lb. from a low-pressure boiler is injected directly into the sand and gravel in the steel bins so that there is no danger of freezing, and the materials flow freely. The mixing water is heated enough to insure the specified temperature at the point of delivery, without getting over the high limit of 120 deg. in the District of Columbia code.

The K Street plant of this company has aggregates and cement hoppers for only its immediate current needs. The plant is built against a side hill, with the top of the aggregates bin slightly above the level of the upper street. A ramp is built out from this street to the top of the bin. All sand and gravel is hauled from the Smoot Sand and Gravel Co., and by using roundabout streets it is brought to the top of the hill on comparatively easy grades. The trucks are backed out on to the ramp, dumping into the bins. There are three compartments in the aggregates bin for sand, 1-in. to ¾-in. gravel, and "regular run" gravel; the latter being an accepted product of the aggregate producers. This bin holds 200 tons of all material.

Covered hopper for delivery of cement



These trucks carry 6 cu. yd. each

Bulk cement is trucked from cars on the K Street freight siding to the cement bin, which stands behind the aggregates bin and holds 50 bbl.

These small bins stand so close together that the weighing can all be done by one man, on Blaw-Knox automatic scales exactly like those in the Super Concrete Corp.'s plant. The aggregates and the cement go into the transit mixer body together. The water tank is filled by the man at the loading station.

Both top-loading and end-loading are accomplished here by means of a supplemental hopper which runs on a track below the discharge opening of the materials chute. When top-loading the supplemental hopper is pushed back out of the way, while for end-loading it is rolled forward until it is under the materials chute, and the truck is then backed in until its conical end engages the chute on this suplemental hopper. For the slight adjustment for height which is sometimes needed to engage the end of the transit body the front of the supplemental hopper is suspended on counterbalanced cables, and is easily raised or lowered.

Simplicity of Routine

Four men operate this plant. One is on top of the materials bin, one at the scales, one at the loading station to charge materials and all water tanks, and one on the order desk. The man on the scales gets his orders on the Telautograph. The simplicity of the whole operation is amazing. Orders are written up on a pad of ruled paper for transfer to the accounting department. Inquiries are recorded on a yellow form which gives full information about a prospect's needs, and these are followed up on the dates noted.

The capacity of the plant is between 5000 and 10,000 yd. a month, or up to 400 yd. a day. It cost, without trucks or other equipment, not over $10,000.

Not all of the fleet of 17 trucks of 1, 2 and 3-yd. capacity, are owned by the Maloney Paving Co. Some of the truck bodies are leased from the Sterrett Operating Service. The transit mixer is mounted on these trucks, and driven by a ring gear connected with a transmission and power take-off which permits the drum to revolve both in transit and while being raised for discharging. It is said that these mixers will dump concrete of zero slump consistency.

Without a large plant to focus attention on production, the interest of those connected with this company is naturally turned toward selling, and this is evidenced by numerous little selling helps which are used from time to time to impress contractors and officials with the uniformity and high quality of the product, and the excellence of the service to be expected on every job.

Prices of Materials

With the prices of their raw materials stable these two plants would operate without conflict, so far as their selling prices and service are concerned. Their prices would not be the same, but there would be room enough for selling arguments to offset a price advantage or disadvantage. But the prices of their raw materials are not stable, and this is especially true of cement. Cement is quoted at present at $2.70 a barrel, in sacks, f.o.b. cars. It is bought in bulk at the cars at $1.80 a barrel. Both of these companies are disturbed by the competition between cement companies and their dealers.

Aggregates are quoted to the Maloney Paving Co. at the producer's bins at $1 for gravel and 55c for sand, and there is a tacit understanding that these prices will be raised by zones. That has been the practice. These prices are said to be quoted on jobs far from the basing point, thus increasing the facility with which contractors' individually operated plants can compete with the pre-mixing plants.

The Rock Products Market

Wholesale Prices of Sand and Gravel

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 in. down	Sand, ¼ in. and less	Gravel, ½ in. and less	Gravel, 1 in. and less	Gravel, 1½ in. and less	Gravel, 2 in. and less
EASTERN:						
Attica and Franklinville, N. Y.	.75	.75	.75	.75	.75	.75
Boston, Mass.‡	1.15	1.15	1.75	.....	1.75	1.75
Buffalo, N. Y.	.....	1.05	1.05	1.05	1.05	1.05
Erie, Penn.	.80	1.00	1.25	.....	1.25	.....
Leeds Jct., Scarboro, Me., and Milton, N. H. (b)	.....	.50	.....	1.75d	1.25	1.00c
Machias Junction, N. Y.	.75	.75	.75	.....	.75	.75
Montoursville, Penn.	1.00	.75	.60	.40	.40	.40
Georgetown, D. C.	.55	.55	1.00	1.00	1.00	1.00
CENTRAL:						
Algonquin, Ill.	.30	.20	.20	.35	.35	.40
Attica, Ind.		All sizes .75–.85 per ton				
Barton, Wis. (e)	.....	.35	.55	.60	.60	.60
Cincinnati, Ohio	.55	.55	.80	.80	.80	.80
Columbus, Ohio	.75–1.00	.50– .75	.60– .75	.60– .75	.60– .75	.60– .75
Des Moines, Iowa	.40– .70	.40– .70	1.50–1.85	1.50–1.85	1.50–1.85	1.50–1.85
Dresden, Ohio	.....	.60	.70– .80	.75	.75	.70
Eau Claire, Wis.	.50	.50	.65	1.00	1.00	.....
Ekhart Lake and Glenbeulah, Wis.	.40	.50	.50	.50	.45	.45
Grand Rapids, Mich.	.....	.50	.70	.70	.70	.70
Greenville, Ohio	.50– .70	.40– .60	.50– .60	.50– .60	.50– .60	.50– .60
Hamilton, Ohio	.65– .75	.65– .75	.65– .75	.65– .75	.65– .75	.65– .75
Hersey, Mich.	.....	.40	.....	.70	.70	.70
Humboldt, Iowa	.....	.45	.....	.....	1.25	.....
Kalamazoo, Mich.	.....	.45	.50	.60	.75	.....
Kansas City, Mo.	.....	.70– .75	.....	1.50	.....	.....
Mankato, Minn.	.....	.45	.....	1.25	1.25	1.25
Mason City, Iowa	.50	.50	.85	1.25	1.25	1.25
Milwaukee, Wis.	.....	.86	.86	.96	.96	.96
Minneapolis, Minn.	.25– .35	.25– .35	1.25–1.35	1.25–1.35	1.25–1.35	1.25–1.35
Oxford, Mich.	.25– .35	.20– .30	.30– .40	.55– .75	.55– .75	.60– .75
St. Louis, Yeatman and Jedburg, Mo., also East St. Louis, Ill.	.60– .75	.45– .85	.50– .90	.20– .90	.20– .90	.50– .90
St. Paul, Minn.	.....	.35	1.25	1.25	1.25	1.25
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.	.....	.45	.60	.60	.65	.65
Winona, Minn.	.40	.40	.50	1.00	1.00	1.00
SOUTHERN:						
Brewster, Fla.	.40	.....	.....	.....	.....	.....
Charleston, W. Va.	.70	1.25	1.25	.....	.....	.....
Eustis, Fla.	.....	.40– .50	.....	.....	.....	.....
Fort Worth, Tex.	1.00	1.00	1.25	1.25	1.25	1.25
Knoxville, Tenn.	.60–1.00	.80–1.00	.....	.....	1.20	1.20
Roseland, La.	.50	.50	1.10	.85	.85	.....
WESTERN:						
Phoenix, Ariz.	1.25*	1.15*	1.50*	1.15*	1.00*	1.00*
Pueblo, Colo.	.80	.60	.....	1.20	.....	1.15
San Gabriel, San Fernando Valleys, Cal. (a)	.80	.70	1.20	1.20	1.20	1.20
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*	1.00*	1.00*

*Cu. yd. ‡Delivered on job by truck. (a) Discount, 20c per ton if paid by 10th of month following delivery. (b) In carload lots. (c) Gravel, 2½-in. down to ¼-in. (d) ⅝-in. down to ¼-in. (e) Plus 10c per ton for winter loading.

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; per ton f.o.b. plant.

City or shipping point	Molding, fine	Molding, coarse	Molding brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	2.60	2.50	2.60	.....	.....	4.00	.....
Cheshire, Mass.	.....	.....	.....	.....	.....	5.00	.....
Columbus, Ohio	1.35–1.50	1.25–1.50	2.00	1.25–1.35	.....	3.50–4.50	.....
Dresden, Ohio	1.15–1.50	1.00–1.35	1.25–1.50	1.00–1.25	1.25	.....	.....
Eau Claire, Wis.	.....	.....	.....	.....	.....	2.00–3.00	.....
Elco, Ill.	Amorphous silica, 90-99½% thru 325 mesh, 10.00–60.00 per ton						
Kasota, Minn.	.....	.....	.....	.....	.....	.....	1.00
Mendota, Va.	Flint, 8.00–10.00 per ton						
Montoursville, Penn.	.....	.....	.....	1.35–1.60	.....	.....	.....
New Lexington, Ohio	2.50	1.75	.....	.....	.....	.....	.....
Ohlton, Ohio	1.75	1.75	.....	1.75	1.75	1.75	.....
Ottawa, Ill.	.....	.....	.....	.....	.....	3.50	.....
Red Wing, Minn. (a)	.....	.....	.....	.....	1.50	3.00	1.50
San Francisco, Calif.	3.50†	5.00†	3.50†	2.50–3.50†	5.00†	3.50–5.00†	.....
South Vineland, N. J.	Washed silica 1.50 per ton; washed and dried silica, 2.00 per ton						

†Fresh water washed, steam dried. *Damp. (a) Filter sand, 3.00.

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Dresden, Ohio	.....	1.00
Eau Claire, Wis.	4.30	.....
Ohlton, Ohio	1.75	1.75
Red Wing, Minn.	.....	1.00
San Francisco, Calif.	3.50	3.50

Glass Sand

(Silica sand is quoted washed, dried and screened)

Cheshire, Mass. (in carload lots)	5.00
Klondike, Mo.	2.00
Mendota, Va.	2.50–3.00
Ohlton, Ohio	2.40
Ottawa, Ill.	1.50
Red Wing, Minn.	1.50
South Vineland, N. J.	1.75
San Francisco, Calif.	4.00–5.00

Bank Run Sand and Gravel

Algonquin, Ill.¶ (½-in. and less)	.30
Buffalo, N. Y.—Sand, 1/10-in. down, 1.00; ¼-in. down, .85; gravel, all sizes	.75
Burnside, Conn. (sand, ¼-in. and less)	.75*
Fort Worth, Tex.¶ (1½-in. and less, .65; 2-in. and less	.65
Gainesville, Tex.¶ (1-in.–1½-in. and less)	.55
Grand Rapids, Mich.¶ (1-in. and less)	.50
Hersey, Mich.¶ (1-in. and less)	.50
Kalamazoo, Mich.¶ (1½-in. and less)	.35
Mankato, Minn.†	.70
Winona, Minn.—Sand, any size	.50– .60
York, Penn.—Sand, 1/10-in. down, 1.10; ¼-in. and less	1.00

*Cu. yd. †Fine sand. 1/10-in. down. ¶Gravel.

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Portland Cement

	F.o.b. city named Per Bag	Per Bbl.	High Early Strength
Albuquerque, N. M.	.82½	3.30	.....
Atlanta, Ga.	.....	†2.15–2.19*	3.45¶
Baltimore, Md.	.....	†2.02–2.26*	3.32¶
Birmingham, Ala.	.....	†1.81–1.85*	3.11¶
Boston, Mass.	.46	†1.84–1.88*	3.14¶
Buffalo, N. Y. (d)	.45½	†1.92–1.95*	3.12–3.22¶
Cedar Rapids, Ia.	.....	2.23*	.....
Charleston, S. C.	.....	1.89†	3.26¶
Cheyenne, Wyo.	.60½	2.42	.....
Chicago, Ill.	.....	1.79†	3.04¶
Cincinnati, Ohio	.....	1.80†	3.05¶
Cleveland, Ohio	.....	1.80†	3.05¶
Columbus, Ohio	.....	1.80†	3.05¶
Dallas, Tex.	.....	1.79–1.90*	3.49¶
Davenport, Iowa	.....	2.14*	.....
Dayton, Ohio	.....	1.80†	3.05¶
Denver, Colo.	.66¼	2.65	.....
Des Moines, Iowa	.48½	2.29*	.....
Detroit, Mich.	.....	1.85†	3.10¶
Duluth, Minn.	.....	2.04*	.....
Houston, Tex.	.....	1.89–2.00*	3.73¶
Indianapolis, Ind.	.54¾	1.79†	3.04¶
Jackson, Miss.	.....	†2.24–2.29*	3.54¶
Jacksonville, Fla.	.....	2.12†	3.43¶
Jersey City, N. J.	.....	†1.99–2.13*	3.29¶
Kansas City, Mo.	.50½	2.02*	3.32¶
Los Angeles, Calif.	.57½	2.30	.....
Louisville, Ky.	.....	1.94†	3.19¶
Memphis, Tenn.	.....	†2.03–2.29*	3.33¶
Milwaukee, Wis.	.....	1.94†	3.19¶
Minneapolis, Minn.	.....	2.27*	.....
Montreal, Que.	.....	1.60‖	.....
New Orleans, La.	.....	1.91†	3.21¶
New York, N. Y.	.49¾	†1.89–2.03*	3.19¶
Norfolk, Va.	.....	1.97*	3.27¶
Oklahoma City, Okla.	.60¾	†2.43–2.46*	3.73¶
Omaha, Neb.	.55½	†2.22–2.36*	3.52¶
Peoria, Ill.	.....	2.12*	.....
Pittsburgh, Penn.	.....	†1.81–1.95*	3.11¶
Philadelphia, Penn.	.....	†2.01–2.15*	3.31¶
Portland, Ore.	.....	2.50‡	.....
Reno, Nev.	.....	2.96‡	.....
Richmond, Va.	.....	†2.18–2.32*	3.48¶
San Francisco, Calif.	.....	2.24‡	.....
Savannah, Ga.	.....	1.89†	3.19¶
St. Louis, Mo.	.48¾	†1.60–1.95*	2.85¶
St. Paul, Minn.	.....	2.27*	.....
Seattle, Wash.	.....	1.50–1.75	2.50c
Tampa, Fla.	.....	2.00†	3.41¶
Toledo, Ohio	.....	1.80†	3.05¶
Topeka, Kan.	.55¼	2.21*	3.51¶
Tulsa, Okla.	.57½	†2.30–2.33*	3.60¶
Wheeling, W. Va.	.....	†1.80–2.02*	3.10¶
Winston-Salem, N.C.	.....	2.44*	3.74¶
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Bellingham, Wash.	.....	2.25	.....
Bonner Springs, Kan.	.....	1.85	3.15¶
Buffington, Ind	.....	1.44†	.....
Concrete, Wash.	.....	2.65	.....
Dallas, Tex.	.....	1.74	.....
Hannibal, Mo.	.....	1.66†	.....
Houston, Tex.	.....	1.84	.....
Hudson, N. Y.	.....	1.61†	3.26¶
Independence, Kan.	.....	1.71†	.....
Leeds, Ala.	.....	1.46†	.....
Limedale, Ind.	.....	1.70	.....
Lime & Oswego, Ore.	.....	2.50	.....
Nazareth, Penn.	.....	2.15	.....
Northampton, Penn.	.....	1.51†	.....
Richard City, Tenn.	.....	2.05	.....
Steelton, Minn.	.....	1.61†	.....
Toledo, Ohio	.....	2.20	.....
Universal, Penn.	.....	1.46†	.....
Waco, Tex.	.....	1.75†	.....

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. *Includes dealer and cash discounts. †Includes 10c cash discount. ‡Subject to 2% cash discount. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. ‖Includes sales tax. (c) Quick-hardening "Velo," packed in paper bags. (d) Also †1.82 per barrel.

Wholesale Prices of Crushed Stone

Prices given are per ton, F.O.B., producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Buffalo, N. Y.	1.25–1.30	1.25–1.30	1.25–1.30	1.25–1.30	1.25–1.30	1.25–1.30
Chazy, N. Y.	.75	1.60	1.60	1.30	1.30	1.30
Ft. Spring, W. Va.	.35	1.35	1.25	1.25	1.15	1.00
Frederick, Md.	.50–1.00	1.50	1.15–1.50	1.15–1.50	1.05–1.25	1.05–1.25
Oriskany Falls and Munnsville, N. Y.	.50–1.00	.....	.....	1.00–1.35	.....	.....
Prospect Junction, N. Y.	1.00	1.25	1.30	1.25	1.25	1.15
Rochester, N. Y.—Dolomite	1.50	1.50	1.50	1.50	1.50	1.50
Hillsville, Penn.	.85	1.35	1.35	1.35	1.35	1.35
Western New York	.85	1.25	1.25	1.25	1.25	1.25
CENTRAL:						
Alton, Ill.	1.75	.....	1.75	.....	.....	.....
Afton, Mich.	.25	.25	.25	.....	.65	1.50
Cypress, Ill.	1.20	1.10	1.10	1.00	.90	.90
Dubuque, Iowa	1.10	1.10	1.10	1.10	1.10	1.10
Stolle and Falling Springs, Ill.	1.05–1.70	.95–1.70	1.15–1.70	1.05–1.70	1.05–1.70	.....
Greencastle, Ind.	1.25	1.00	1.00	.90	.90	.90
Lannon, Wis.	.80	.80	.80	.80	.80	.80
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Stone City, Iowa	.75	.....	1.10	1.00	1.00	1.00f
Toledo, Ohio (a)	1.10	1.60	1.60	1.60	1.60	1.60
Toronto, Canada (j)	2.20	2.20	2.20	2.20	2.20	2.20
Waukesha, Wis.	.90	.90	1.00	1.00	1.00	.....
SOUTHERN:						
Cartersville, Ga.	.75	1.15	1.15	1.00	.90	.90
Chico, Tex.	.50	1.30	1.30	1.25	1.20	.....
El Paso, Tex. (k)	.50	1.25	1.25	1.00	1.00	1.00
Olive Hill, Ky.	.50–1.00	1.00	1.00	.90	.90	.90
WESTERN:						
Atchison, Kan.	.50	1.80	1.80	1.80	1.80	1.70
Blue Springs and Wymore, Neb. (h)	.25	.25	1.45	1.35c	1.25d	1.20
Cape Girardeau, Mo.	1.10	1.25	1.25	1.25	1.00	.....
Rock Hill, St. Louis Co., Mo.	1.30–1.40	1.30–1.40	1.10–1.40	1.30–1.40	1.30–1.40	1.30–1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Birdsboro, Penn.	1.20	1.60	1.45	1.35	.....	1.30
Branford, Conn.	.80	1.70	1.45	1.20	1.05	.....
Bridgeport, Chico and Knippa, Texas	2.25–2.50	1.80–2.00	1.50–1.60	1.30–1.40	1.20–1.30	1.00–1.25
Duluth, Minn.	1.00	2.25	1.75	1.65	1.35	1.25
Eastern Maryland	1.00	1.60	1.60	1.50	1.35	1.35
Eastern Massachusetts	.85	1.75	1.75	1.25	1.25	1.25
Eastern New York	.75	1.25	1.25	1.25	1.25	1.25
Eastern Pennsylvania	1.10	1.70	1.60	1.50	1.35	1.35
Farmington, Conn.	1.00	1.30	1.30	1.00	.....	.....
Knippa, Texas	2.50	2.50	2.50	1.20	.....	.....
New Britain, Plainville, Rocky Hill, Middlefield, Meriden, Mt. Carmel, Conn.	.80	1.70	1.45	1.20	1.05	.....
Northern New Jersey	1.55	2.30	2.10	1.70	1.70	.....
Richmond, Calif.	.75	.....	1.00	1.00	1.00	.....
Toronto, Canada (j)	4.80	5.90	4.05	.....	.....	.....
Westfield, Mass.	.60	1.50	1.35	1.20	1.10	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Cayce, S. C.—Granite	.....	.....	1.60	1.60	1.40	.....
Eastern Pennsylvania—Sandstone	1.35	1.70	1.65	1.40	1.40	1.40l
Eastern Pennsylvania—Quartzite	1.20	1.35	1.25	1.20	1.20	1.20
Lithonia, Ga.—Granite	.50	1.25	1.25	1.10	1.00	.....
Lohrville, Wis.—Granite	1.80	1.60	.....	1.50	1.50	.....
Middlebrook, Mo.—Granite	3.00–3.50	.....	2.00–2.25	2.00–2.25	.....	1.25–3.00
San Gabriel and San Fernando Valleys, Calif. (Granite)	.....	1.30	1.30	1.30	.....	1.30
(Basalt)	.....	.....	.....	.85	.....	.....
Toccoa, Ga.—Granite	.50	.....	1.25	1.30	1.20	1.20

(a) Screenings, including dust. (c) 1-in., 1.40. (d) 2-in., 1.30. (f) Rip rap. (g) Cu. yd. (h) Rip rap, 1.20–1.40 per ton. (j) Extra charge of 10c per ton for winter delivery; all prices less 5% for payment 15th following month. (k) Roofing gravel, per ton, 1.25. (l) Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Bethlehem, Penn.	1.25–1.50	.50– .60	1.00	.60– .70	.70– .80	.70– .90	.90
Buffalo, N. Y., Erie and Du Bois, Penn.	2.25	1.25	1.25	1.35	1.25	1.25	1.25
Hokendauqua, Penn.	1.50	.60	1.00	.80–1.00	1.00–1.25	1.00–1.25	1.00–1.25
Pittsburgh, Penn.	2.00	1.25	1.25	1.25	1.25	1.25	1.25
CENTRAL:							
Ironton, Ohio	.....	1.05*	1.80*	1.45*	1.45*	1.45*	1.45*
Jackson, Ohio	.....	.65*	1.55*	1.30*	1.05*	1.30*	1.30*
Toledo, Ohio	1.10	1.00‡	1.10	1.10	1.10	1.10	1.10
SOUTHERN:							
Ashland, Ky.	.....	1.05*	1.65*	1.45*	1.45*	1.45*	1.45*
Ensley & Alabama City, Ala.	2.05	.55	1.25	1.15	.90	.90	.80
Longdale, Va.	2.50	1.25	1.25	1.25	1.25	1.15	1.05
Woodward, Ala.†	2.05*	.55*	.....	1.15*	.90*	.90*	.....

5c per ton discount on terms. †1½-in. to ¼-in., 1.05; ⅝-in. to 10 mesh, 1.25*; ⅝-in. to 0-in., 90c*; ¼-in. to 10 mesh, .80*. ‡Including dust.

Agricultural Limestone (Pulverized)

Cape Girardeau, Mo.—Analysis, $CaCO_3$, 94½%; $MgCO_3$, 3½%; 50% thru 50 mesh	1.50
Cartersville, Ga.	2.00
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, per ton	6.00
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; bulk, 3.00; in bags	4.50
Hillsville, Penn.—Analysis, 94% $CaCO_3$, 1.40% $MgCO_3$, 75% thru 100 mesh; in bags	5.00
Jamesville, N. Y.—Bulk, 3.90; in 80-lb. bags	5.15
Joliet, Ill.	3.50
Knoxville, Tenn.—Analysis, 52% $CaCO_3$; 36% $MgCO_3$; 80% thru 100 mesh, in 100-lb. paper bags, 3.75; bulk	2.50
Marion, Va.—Analysis, 90% $CaCO_3$, 2% $MgCO_3$; per ton	2.00
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
West Rutland, Vt. — Analysis, 96.5% $CaCO_3$; 1% $MgCO_3$; 90% thru 50 mesh; bags, per ton, 3.75; bulk	2.50

Agricultural Limestone (Crushed)

Alton, Ill.—Analysis, 99% $CaCO_3$; 0.3% $MgCO_3$, 90% thru 100 mesh	4.00
Bedford, Ind.—Analysis, 98.44% $CaCO_3$; 0.83% $MgCO_3$; 90% thru 10 mesh	1.50
Cartersville, Ga.—90% thru 50 mesh, per ton	1.25
Chico, Tex.—Limestone flour, or mill floats, per 100-lb. bag, f.o.b. plant	1.00
Colton, Calif.—Analysis, 95-97% $CaCO_3$; 1.31% $MgCO_3$, all thru 14 mesh down to powder	3.50
Cypress, Ill.—90% thru 100 mesh, 1.25; 50% thru 100 mesh, 1.25; 90% thru 50 mesh, 1.25; 50% thru 50 mesh, 1.25; 90% thru 4 mesh, 1.25; and 50% thru 4 mesh	1.25
Davenport, Iowa — Analysis, 92-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 4 mesh, 50% thru 20 mesh; bulk, per ton	1.10
Dolomite, Calif.—Analysis, 54% $CaCO_3$; 45% $MgCO_3$; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton	1.70
Dubuque, Ia.—Analysis, 64.20% $CaCO_3$; 32.64% $MgCO_3$; 50% thru 50 mesh	1.10
Fort Spring, W. Va.—Analysis, 90% $CaCO_3$; 3% $MgCO_3$; 90% thru 50 mesh; bulk, per ton	1.15
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; 50% thru 50 mesh	1.25
Lannon, Wis. — Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh	2.00
Screenings (¼-in. to dust)	1.00
Marblehead, Ohio—90% thru 100 mesh	3.00
90% thru 50 mesh	2.00
90% thru 4 mesh	1.00
Marlbrook, Va.—Precipitated lime-marl. Analysis, 96% $CaCO_3$; 1% $MgCO_3$, 90% thru 50 mesh, bulk, 2.25; in burlap bags	3.75
Olive Hill, Ky.—90% thru 4 mesh, two grades, per ton	.50 & 1.00
Branchton, Penn.—100% thru 20 mesh, 60% thru 100 mesh, and 45% thru 200 mesh, per ton	a4.00
Piqua, Ohio—30%, 50% and 99% thru 100 mesh	1.00–4.00
Stolle and Falling Springs, Ill.—Analysis, 89.9% $CaCO_3$, 3.8% $MgCO_3$; 90% thru 4 mesh	1.15–1.70
Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
West Stockbridge, Mass.* — Analysis, 95% $CaCO_3$; 90% thru 50 mesh, bulk	3.50
100-lb. paper bags, 4.75; 100-lb., cloth	5.25
Waukesha, Wis.—90% thru 100 mesh, 4.00; 50% thru 100 mesh	2.10

*Less 25c cash 15 days. (a) Less 50c comm.

Pulverized Limestone for Coal Operators

Davenport, Iowa—Analysis, 97% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton	6.00
Joliet, Ill.—Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh (bags extra)	3.50
Piqua, Ohio—99% thru 100 mesh, bulk, 3.25; in 80-lb. or 100-lb. bags	4.25
Rocky Point, Va.—Analysis, 97% $CaCO_3$; 75% $MgCO_3$; 85% thru 200 mesh, bulk	2.25–3.50
Waukesha, Wis.—90% thru 100 mesh, bulk	4.00

Lime Products

(Carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Bulk	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
EASTERN:								
Berkeley, R. I.	.....	.....	10.50	.....	.....	17.50	.....	19.25
Buffalo, N. Y.	.....	.....	.....	11.00	.....	.....	.....	.....
Cedar Hollow, Devault, Mill Lane, Knickerbocker, Rambo and Swedeland, Penn.	.....	9.50e	9.50e	9.50e	8.00i	9.50g	8.50	.....
Frederick, Md.	.....	8.50	8.50	8.50	.....	8.50	6.50	13.50
Lime Ridge, Penn.	.....	.....	8.00	.....	6.50	7.50a	4.50	.....
West Stockbridge, Mass.	.....	8.25– 8.75	8.25– 8.75	.....	.....	13.50j	10.00	15.35
CENTRAL:								
Afton, Mich.	.....	.....	.....	.....	.....	10.85	6.50	.....
Cold Springs, Ohio	.....	6.00	6.00	.....	.....	.....	6.00	.....
Clay Center, Gibsonburg, Marblehead, Tiffin, Ohio, and Huntington, Ind.	7.75	6.00	6.00	11.00	6.00	8.00	6.00	.....
Delaware, Ohio	7.75	6.00	6.00	7.00	6.00	.....	6.00	.....
Milltown, Ind.	.....	9.00	8.25	9.50	7.50	.....	7.00	.....
Sheboygan, Wis.	.....	10.50	10.50	.....	.....	.....	9.50	20.00h
White Rock, Ohio	7.75	.....	6.00	.....	6.00	8.00	6.00	.....
Woodville, Ohio	7.75	6.00	6.00	9.00	6.00	.....	6.00	15.00f
SOUTHERN:								
Keystone, Ala.	15.00	8.00	.....	7.50– 8.00	.....	.....	5.50k	13.75m
Ocala, Fla.	17.25	10.00	10.00	11.00	.....	.....	10.50	1.50
Knoxville, Tenn.	.....	8.00	8.00	7.50	.....	.....	6.00	12.50
Pine Hill, Ky.	.....	9.00	8.00	7.50– 9.00	.....	.....	6.00	12.50
WESTERN:								
Little Rock, Ark.	.....	14.30	.....	14.30	.....	.....	.....	17.40
Kirtland, N. M.	.....	.....	.....	.....	.....	.....	15.00	.....
Los Angeles, Calif.	15.50	14.50	.....	.....	.....	.....	16.00	.....
San Francisco, Calif. (d)	20.00	20.00	12.00	20.00	.....	.....	.....	.....
San Francisco, Calif.	19.00	14.00–17.00	12.50	14.00–19.00	14.50c	.....	11.00b	.....

(a) In 100-lb. bags. (b) To 14.50. (c) Also 13.00. (d) Woodburnt lime: finishing hydrate, 20.00 per ton; pulv. lime, 2.00 per iron drum. Oil-burnt pulv. lime, 13.00–14.50 per ton. (e) In 50-lb. paper. (f) In steel; in wood, 14.00. (g) In 80-lb. paper bags. (h) In steel. (i) For chemical purposes. (j) To 17.50. (k) To 6.50. (m) To 14.85. *Price to dealers.

Wholesale Prices of Slate

Prices given are f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200-mesh, 6.00 per ton in paper bags

Slate Granules

Esmont, Va.—Blue, 7.50 per ton. Granville, N. Y.—Red, green and black, 7.50 per ton.
Pen Argyl, Penn.—Blue-black, 6.00 per ton in bulk.

Roofing Slate

City or shipping point	Prices per square—Standard thickness 3/16-in.	¼-in.	⅜-in.	½-in.	¾-in.	1-in.
Bangor, Penn.—						
Gen. Bangor No. 1 clear	10.00–14.00	20.00	25.00	29.00	40.00	50.00
Gen. Bangor No. 1 ribbon	9.00–10.25	16.00	20.00	25.00	35.00	46.00
No. 1 Albion	7.25–10.50	16.00	23.00	27.00	37.00	46.00
Gen. Bangor No. 2 ribbon	6.75– 7.25	.....	.....	.....	.....	.....
Granville, N. Y.—						
Sea green, weathering	14.00	24.00	30.00	36.00	48.00	60.00
Semi-weathering, green & gray	15.40	24.00	30.00	36.00	48.00	60.00
Mottled purple & unfading gr'n	21.00	24.00	30.00	36.00	48.00	60.00
Red	27.50	33.50	40.00	47.50	62.50	77.50
Pen Argyl, Penn.						
Graduated slate	.....	16.00	23.00	27.00	37.00	46.00

Albion blue-grey roofing slate, No. 1 clear, 7.25–10.50; mediums, 8.00–9.00; No. 1 ribbon, 8.00–8.50

(a) Prices are for standard preferred sizes (standard 3/16-in. slates), smaller sizes sell for lower prices.
(b) Prices other than 3/16-in. thickness include nail holes.
(c) Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chatsworth, Ga.:
- Crude talc, per ton 5.00
- Ground talc (20-50 mesh), bags 6.50
- Ground talc (150-200 mesh), bags 9.00
- Pencils and steel crayons, gross 1.50– 2.00

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¾% thru 200 mesh, 8.00–8.50; Grade B, 97-98% thru 200 mesh 7.00– 7.50
1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.

Clifton, Va.:
- Ground talc (150-200 mesh), in bags 10.00

Emeryville, N. Y.:
- Ground talc (200 mesh), bags 13.75
- Ground talc (150-200 mesh), in bags .. 5.50– 8.25

Hailesboro, N. Y.:
- Ground talc (300-350 mesh), in 200-lb. bags 15.50–20.00

Henry, Va.:
- Crude (mine run), bulk 3.50– 4.00
- Ground talc (150-200 mesh), in bags .. 5.50– 8.25

Joliet, Ill.:
Ground talc (200 mesh), in bags:
- California talc 30.00
- Southern talc 20.00
- Illinois talc 10.00

Los Angeles, Calif.:
- Ground talc (150-200 mesh), in bags .. 15.00–25.00

Natural Bridge, N. Y.:
- Ground talc (325 mesh), bags 10.00–15.00

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Gordonsburg, Tenn. 4.25– 4.75
Mt. Pleasant, Tenn.:
- B.P.L. 78%, furnace lump 6.25
- B.P.L. 72%, run of plant lump & fines 5.00

Ground Rock
(2000 lb.)

Gordonsburg, Tenn. 5.25– 6.00
Mt. Pleasant, Tenn.—(Lime phosphate)
- —B.P.L. 75%; per ton, bags extra 12.80

Mt. Pleasant, Tenn.—B.P.L. 72% 5.00– 5.25

Florida Phosphate

(Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines
- 68/66% B.P.L. 3.15
- 70% minimum B.P.L. 3.75
- 72% minimum B.P.L. 4.25
- 75/74% B.P.L. 5.25
- 77/76% B.P.L. 6.25

Mica

Prices given are net, f.o.b. plant or nearest shipping point.

Rumney Depot, Bristol and Cardigan, N. H.—Per ton:
- Punch mica, per ton 150.00–240.00
- Mine scrap 22.50
- Mine run 325.00
- Clean shop, scrap 25.00
- Roofing mica 37.50
- Trimmed mica, per ton, 20 mesh, 37.50; 40 mesh, 40.00; 60 mesh, 40.00; 100 mesh, 45.00; 200 mesh 60.00

Spruce Pine, N. C.—Mine scrap, per ton 18.00– 20.00

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

City or shipping point	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ¼x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
East St. Louis, Ill.—Special Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide, 6 in. thick, and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton; floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 6 in. long, 17c per ft., 23.00 per ton.													
Grand Rapids, Mich.	.....	.....	.....	9.00	9.00	9.00	.....	.....	.....	.....	15.00	15.00	27.00
Los Angeles, Calif. (a)	.....	7.50	7.50	12.20	12.20	.....	13.20	.....	29.00	.....	.....	.....	.....
Medicine Lodge, Kan.	1.40	.....	.....	.....	.....	.....	11.50b	.....	16.00b	11.50b	.....	.....	.....
Oakfield, N. Y.	2.50	.....	.....	6.00	9.00b	9.00b	.....	6.00b	.....	.....	.....	.....	.....
San Francisco, Calif.	.....	.....	.....	.....	14.90b	.....	.....	.....	.....	.....	.....	.....	.....
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	——	——	——	——	20.00	25.00e	33.00d

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable). (a) ⅜-in. plaster lath, 16c per sq. yd. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ⅜-in.x48-in. by 5 and 10 ft. long. (e) ⅜x48-in. by 3 to 4 ft. long.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N.Y.—Bio-Spar, per ton in bags, in carload lots, 9.00; less than carload lots, per ton in bags		12.00
Crown Point, N. Y.—Mica Spar		¶9.00–‖12.00
Davenport, Ia. — White limestone, in bags, ton	‖6.00	‖6.00
Los Angeles, Calif.—(e) White	¶12.00–‖14.50	¶12.00–‖14.50
Snowflake		¶12.00–‖14.50
Golden, browns, grey, blues, blacks	¶16.00–‖18.50	¶16.00 ‖18.50
Dolomite, Calif. (Lone Pine)—(e) White	¶9.80– ‖9.80	¶9.80– ‖9.80
Snowflake		¶9.80– ‖9.80
Golden, browns, grey, blues, blacks	¶13.80–‖13.80	¶13.80–‖13.80
Middlebrook, Mo.—Red		20.00– 25.00
Middlebury, Vt.—White		¶9.00–‖10.00
Middlebury & Brandon, Vt. — Caststone, per ton, including bags		c5.50
Phillipsburg, N. J.—Royal green granite, in bags	15.00– 18.00	
Randville, Mich.—Crystalite, crushed white marble, bulk	4.00	4.00– 7.00
Tuckahoe, N. Y.	6.00	
Warren, N. H. (d)		¶8.00– 8.50

¶C.L. ‖L.C.L. (a) Including bags. (b) In burlap bags, 2.00 per ton extra. *Per 100 lb. (c) Per ton f.o.b. quarry in carloads; 7.00 per ton L.C.L. (d) L.C.L., 9.50-15.00 per ton in 100-lb. bags (e) Including bags.

Art and Cast Stone Aggregates

Los Angeles, Calif.—Dolomite aggregates, all sizes and colors†	¶10.00	‖12.50
Dolomite special cast stone, wet cast aggregate, white, ¼-in. to dust	a4.70	

† 100-lb. sacks. ¶C.L. ‖L.C.L. (a) In open cars.

Chicken Grits

Cypress, Ill.—(Agstone), per 100-lb. sack	.90
Chico, Tex.—Hen size and Baby Chick, packed in 100-lb. sacks, per 100-lb. sack, f.o.b. Chico	1.00
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	6.00
El Paso, Tex.—(Limestone), per 100-lb. sack	.75
Gibsonburg, Ohio—(Agstone)	10.00
Joliet, Ill.—(Agstone)	10.00
Los Angeles, Calif.—(Gypsum), per ton, including sacks	7.50– 9.50
Marble grits, per ton, incl. sacks	10.00–12.50
Middlebury, Vt.—Per ton (a)	10.00
Piqua, Ohio—(Pearl grit), No. 1 and No. 2	1.00– 4.00
Port Clinton, Ohio—(Gypsum), per ton	6.00
Randville, Mich.—(Marble), per ton, bulk	6.00
Warren, N. H.	8.50– 9.50
Waukesha, Wis.—(Limestone), per ton	7.00
West Stockbridge, Mass.	¶7.50–‖9.00

(a) F.o.b. Middlebury, Vt. ¶C.L. ‖L.C.L.

Cement Drain Tile

Grand Rapids, Mich.—Drain tile, per 1000 ft.

4-in.	40.00	15-in.	325.00
5-in.	50.00	18-in.	450.00
6-in.	75.00	20-in.	600.00
8-in.	110.00	22-in.	750.00
10-in.	165.00	24-in.	850.00
12-in.	190.00		

Granular Glasspar

(Chemically Controlled)

Spruce Pine, N. C.—Color, white; analysis, K_2O, 7.20%; Na_2O, 3.70%; SiO_2, 70%; Fe_2O_3, 0.05%; Al_2O_3, 17.50%; per ton, in bulk — 10.50

Soda Feldspar

De Kalb Jct., N. Y.—Color, white; pulverized (bags extra, burlap 2.00 per ton, paper 1.20 per ton); 99% thru 140 mesh, 16.00; 99% thru 200 mesh — 18.00

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 5.50%; Na_2O, 5.50%; SiO_2, 68.80%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk — 18.00

Potash Feldspar

East Liverpool, Ohio — Color, white; analysis, K_2O, 11.00%; Na_2O, 2.25%; SiO_2, 68.00%; Fe_2O_3, .08%; Al_2O_3, 17.95%, pulverized, 99% thru 200 mesh, in bags, 22.00; in bulk — 20.00

Erwin, Tenn.—White; analysis, K_2O, 10.50%; Na_2O, 2.75%; SiO_2, 67.75%; Fe_2O_3, .08%; Al_2O_3, 18.00%, pulverized, 98% thru 200 mesh, in bags, 16.00; bulk — 15.00

Crude, in bags, 7.50; bulk — 6.50

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.30%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk — 18.00

Trenton, N. J.—Color, white; analysis, K_2O, 10%; Na_2O, 3%; SiO_2, 69%; Fe_2O_3, 0.08%; Al_2O_3, 17%; pulverized, 98% thru 200 mesh; bulk, 20.00; in bags — 21.20

West Paris, Me.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.20%; Na_2O, 3.20%; SiO_2, 65.70%; Fe_2O_3, 0.09%; Al_2O_3, 19.20%; per ton, in bulk — 19.00

Rochester, N. Y.—Color, white; analysis, K_2O, 12.50%; Na_2O, 2.60%; SiO_2, 64.20%; Fe_2O_3, 0.06%; Al_2O_3, 19.10% pulverized 98% thru 200 mesh; in bags, 23.50; bulk — 22.00

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

Beloit, Wis.:	
4x8x16. Each	.11
6x8x16. Each	.13
8x8x16. Each	.15
10x8x16. Each	.19
12x8x16. Each	.21
Brookville, Penn.: 8x8x16	20.00–23.00*
Camden, N. J.: 8x8x16, each	.18b
Chicago, Ill.:	
8x8x16. Each	.17§
8x8x16. Each	.20a
Columbus, Ohio: 8x8x16	14.00§–16.00‡
Graettinger, Iowa	.18– .20
Indianapolis, Ind.	.10– .12‡
Lexington, Ky.:	
8x8x16	‡18.00*
8x8x16	†16.00*
Los Angeles, Calif.:	
4x8x12	4.50*
4x6x12	3.90*
4x4x12	2.90*
Omaha, Neb.: (c)	
8x 4x16, each .06½§; 8x6x16, each	.09§
8x 8x16, each, .10§; 8x12x16, each	.15§
Oak Park, Ill.:	
8x8x16, per 1000	160.00
Passaic, N. J.: 8x8x16 in. Each	.16
12x8x16 in. Each	.24
Pittsburgh, Penn. (Prices at yard)	
8x 8x16. Each	.17§
8x 8x16. Each	.19a
8x12x16. Each	.20§
8x12x16. Each	.22a
Wichita, Kan.: 8x8x16. Each	.11§

*Price per 100 at plant.
†Rock or panel face.
‡Face. §Plain. (a) Rock face. (b) Less 10%. (c) Faced block, priced 2c higher than plain block prices quoted.

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French tile, 9x15 in., per sq.	9.50–11.50
Spanish tile, 9x15 in., per sq.	10.00–12.00
Indianapolis, Ind.—9x15-in.	Per sq.
Gray	10.00
Red	11.00
Green	13.00
Lexington, Ky.—8x15, per sq.: Red	15.00
Green	18.00
Longview, Wash.: 4x6x12-in., per 1000	55.00
4x8x12-in., per 1000	65.00
New Castle, Penn.—Red, 9x15-in.	12.00
Green, 9x15-in.	15.00
New York City, N. Y.:	
Roofing tile, red, 10.00; green	12.00

Cement Building Tile

Oak Park, Ill. (Haydite):	
8x 8x16, per 100	20.00
Lexington, Ky.:	
5x8x12, per 1000	55.00
4x5x12, per 1000	35.00
Longview, Wash. (Stone Tile):	
4x6x12, per 1000, at plant	54.00
4x8x12, per 1000, at plant	64.00
Prairie du Chien, Wis.:	
5x8x12, per 1000	78.00
5x4x12, per 1000	46.00
5x8x6, per 1000	41.00

Wichita, Kan.: (Duntile)	Plain	Glazed
8x8x12. Each	.10½	.14
6x8x12. Each	.09½	.13
4x5x12. Each	.05	.08
4x4x12. Each	.04½	.07½

Concrete Brick

Prices given per 1000 brick, f.o.b. plant.

	Common	Face
Beloit, Wis.	18.00	26.00– 35.00
Oak Park, Ill., "Haydite"	16.00	
Ensley, Ala., "Slagtex"	..*10.00–13.00†	
Milwaukee, Wis.	14.00	20.00– 42.50
Omaha, Neb.	15.00	
Prairie du Chien, Wis.	14.00	22.00– 25.00
Rapid City, S. D.	16.00–18.00	30.00– 35.00

*Price f.o.b. plant. †Delivered on job in city.

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00
Joliet, Ill.—All passing 100 mesh, f.o.b. Joliet, including cost of bags	24.00

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Asheville, N. C.	35.00	50.00	60.00
Atlanta, Ga.	29.00	42.50	53.00
Brownsville, Tex.	.....	53.00	62.50
Brunswick, Me.†	40.00	60.00	80.00
Charlotte, N. C.	35.00	45.00	60.00
De Land, Fla.	30.00	50.00	60.00
Farmingdale, N. Y.	37.50	50.00	60.00
Houston, Tex.	35.00	45.00	60.00
Jackson, Miss.	45.00	55.00	65.00
Klamath Falls, Ore.	65.00	75.00	85.00
Longview, Wash.	.....	55.00	64.00
Los Angeles, Calif.	29.00	39.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	50.00	55.00	65.00
Mineola, N. Y.	45.00	50.00	60.00
Nashville, Tenn.	30.00	49.00	57.00
New Orleans La.	35.00	45.00	60.00
Norfolk Va.	35.00	50.00	65.00
Passaic, N. J.	40.00	52.50	70.00
Patchogue, N. Y.	.....	60.00	70.00
Pawtucket, R. I.	35.00	55.00	75.00
Safford, Ariz.	32.50	48.75	65.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50

Prices are for standard sizes—No. 4, size 3½x 4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size 3½x8x12 in. *Delivered on job. †10% discount.

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4-in.	6-in.	8-in.	10-in.	12-in.	15-in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in.
Grand Rapids, Mich. (b)																	
Sewer	.....	.12	.18–.20	.27½	.35	.57½	1.00	1.11	1.48	1.66	.....	.....	.....	.....	.....	.....	.....
Culvert	.....	.....	.....	.57	.67	.93	1.20	.....	1.48	1.80	2.10	2.25	3.35	4.00	5.10	5.85	7.42
Indianapolis, Ind. (a)	.....	.....	.....	.75	.85	.90	1.15	.....	.....	1.60	.....	2.50	.....	.....	.....	.....	.....
Mercedes, Texas																	
Tongue and groove	.16	.20	.23	.29	.35	.....	.74	.91	.....	1.38	.....	2.28	.....	.....	.....	.....	.....
Sewer	.16	.22	.32	.41	.53	.78	1.05	.....	.....	1.98	.....	.....	.....	.....	.....	.....	.....
Milwaukee, Wis.						Cast stone window sills, 5 in. x 5½ in., 50c per lineal ft.											
Newark, N. J. (d)	.....	.....	.....	.....	.90	1.15	1.50	.....	.....	1.85	2.35	2.76	3.77	4.93	6.21	7.66	9.28
Unreinforced	.....	.16	.25	.37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Norfolk, Neb.	.....	.....	.....	.90	1.00	1.13	1.42	.....	.....	2.11	.....	2.75	3.58	.....	6.14	.....	7.78
Tiskilwa, Ill. (e)	.....	.....	.....	.75	.85	.95	1.20	1.60	.....	2.00	.....	2.75	3.40	.....	6.50	.....	10.00
Wahoo, Neb. (c)	.....	.....	.....	.85½	.....	.....	1.14	.....	.....	1.81	.....	2.47	3.42	4.13	5.63	6.49	7.31

†21-in. diam. (a) 24-in. lengths. (b) Sewer, 21-in., 1.29; culvert, 21-in., 1.45. (c) Reinforced, 15.40 per ton, f.o.b. plant (d) Reinforced, 21-in., 1.69; unreinforced, 21-in., 1.26; 5% cash discount. (e) Reinforced.

News of All the Industry

New Incorporations

Rotary Stone Co., Independence, Kan., $25,000.

Western Limestone Products Co., Omaha, Neb., 50,000 to 200,000 shares of no par value stock.

Alabama Concrete Pipe Co., Birmingham, Ala., $25,000.

Arnold Stone Co. of North Carolina, Inc., Greensboro, N. C.

Interlocking Concrete Pipe Co., Ltd., Toronto, Ont., Can., 40,000 shares of no par value.

Winitoba Marble Co., Ltd., Winnipeg, Man., Can., 50,000 shares of no par value.

The Georgian Bay Gravel Co., Ltd., Sandwich, Ont., Can., $60,000. John M. Lorimer and others.

Bethany Falls Limestone Co., Wilmington, Del., 2000 shares common.

North Cincinnati Sand and Gravel Co., Inc., Cincinnati, Ohio, $30,000. Leonard H. Freiberg, St. Paul Bldg., Cincinnati.

The American Silica Sand Co., Wilmington, Del., 250,000 shares common stock. To produce gypsum, lime, cement and cement products.

Moraine Gravel and Sand Co., Dayton, Ohio, 250 shares stock of no par value. Clifton Hoolihan, E. B. Raymond and Thomas H. Ford.

J. G. Ray Stone Co., Inc., Bloomington, Ind., 100 shares at $100 per share. J. G. Ray, S. K. Norton and P. M. Norton.

Hopkinsville Stone Co., Hopkinsville, Ky., $25,000. A. W. Partee, William H. Petri and Gates F. Young.

Logansport Stone and Lime Co., Logansport, Ind., is reported to have filed papers evidencing preliminary dissolution.

Mo-Roc-Asphalt Co., Kansas City, Mo., $100,000. T. S. Blakesley, Lathrop Bldg., Kansas City, and I. J. McColman.

Central States Terrazzo Corp., Cicero, Ill., $16,000 common stock and 800 shares of no par value. Orestes Urban, Cecil Caplow and E. Borkan.

Pillman Sand and Gravel Co., Evansville, Ind., 300 shares of no par value. M. J. Rice, president, and Charles H. Pillman, vice-president.

Windsor Sand and Gravel Co., Ltd., Windsor, Ont., Can., increased capital to 10,000 shares of no par value.

Peerless Stone, Ltd., Toronto, Ont., Can., 100,000 shares of no par value. Frederick E. Beer, Wm. E. Jepson and others.

Provincial Sand and Gravel Co., Ltd., Montreal, Que., Can., $10,000, consisting of 100 shares, par value $100 each.

Lake Nipigon Marble Corp., Ltd., Toronto, Ont., Can., 20,000 shares of no par value. O. W. Elmore, Thomas Marshall and others.

Kannenberg Granite Co., Wausau, Wis., $45,000. Ernest Kannenberg, Sr., president; Frank Schock, vice-president; Roland K. Kannenberg, secretary and treasurer.

Guenette Granite Co., Ltd., Guenette, Que., Can., $100,000, consisting of 1000 shares, par value $100 each. To operate stone, granite and marble quarries.

Quarries

C. E. Leaphart has leased a tract of land at Lexington, N. C., for the development of a quarry.

Le Grand, Ia. Machinery is being repaired and the plant and quarry here put in readiness to begin operations on March 1.

D. Y. Johnson Stone Co., Nashville, Tenn., has opened a rock quarry near Hedgecoth, Tenn. David M. Johnson, Nashville, and J. G. Robinson, Philadelphia, are associated in the enterprise, and O. W. Smith is in charge of the operation.

Milwaukee Electric Co. will use stone from its own quarry for the construction of its new plant at Port Washington. The company's quarry is located at Thiensville, Wis. About 62,000 tons of limestone will be required, and this will be hauled over the Milwaukee Northern tracks.

Grundy Center, Ia. A preliminary survey indicates that there is a heavy layer of stone on the Verley farm, located a mile across the Grundy county line in Tama county, and it is believed the supply is large enough to make it possible to open a quarry here for the production of stone for use on the county roads.

Thunder Bay Quarries, Alpena, Mich. Work on the quarry plant railway is progressing rapidly, and blasting operations in connection with the building of the tunnel which will eliminate intersection of the quarry plant's railway and railway company tracks, has been completed. Construction of the elevated base for the plant railway which is to cross over Ford avenue is going ahead rapidly.

Larimer and Shaffer, Cedar Rapids, Ia., have entered a petition for the rezoning of certain property within the city limits, to be used for the company's quarry, the petition requesting that the property be rezoned from class A residential to heavy industrial. A portion of the territory owned by the company lies outside the city limits, and if the petition is granted the company will extend its operations on the property mentioned.

Ross Republic Marble Co., Knoxville, Tenn., has been merged with the Ross-Republic Marble Corp., according to an announcement made by Grant Huntley of New York, vice-president and general manager of the corporation. The Ross-Republic Marble Corp. has operated the Ross Republic Marble Co. under a lease for the past year. Frank S. Mead, Knoxville, owner of the Ross Republic Marble Co., becomes minority stockholder in the Ross-Republic corporation, which is a subsidiary of the Virginia Alberene Corp. J. J. Brown of New York is president of the merged companies.

Sand and Gravel

Gravel Products Corp., Buffalo, N. Y., has acquired two additional acres of land at the foot of Hamilton street in Buffalo.

Lenawee Sand and Gravel Co., Tecumseh, Mich., held its annual meeting recently and elected the following officers: J. T. Carpenter, president; Fred Blouch, vice-president; Frank Hoffman, secretary, and J. J. Backmeyer, treasurer.

Traverse City, Mich. Fire virtually destroyed a building housing the office, shop and storeroom at the Wysong gravel pit recently. Files and one truck were saved, but furnishings, machinery and numerous concrete forms were destroyed.

H. L. Seabright Co. is starting gravel digging operations on Short Creek in West Virginia. Plans are being made to purchase more equipment for the digging and transportation of the gravel and sand from Short Creek to the company's storage plant at Wheeling, W. Va.

Eau Claire Sand and Gravel Co., operating a gravel pit at Gravel Island, two and one-half miles southwest of Chippewa Falls, Wis., has contracted to supply the washed gravel for the new bridge to be built in Eau Claire, Wis., and expects also to supply material for a considerable amount of highway work to be done in Eau Claire county.

Albany Sand and Gravel Co., Albany, Ore., is erecting a small building adjacent to the main plant of the company, to house the new 100-hp. electric hoist recently added to its equipment. The new hoist will operate the dragline. The company has made many improvements to the plant during the past year, including new railroad sidings and installation of a power crane with clamshell attachment for loading and unloading.

Brown and Rosenberg have entered a contract for the operation of a gravel pit on the Isaac B. Lowry farm, located two and one-half miles north of Montpelier, Ind. Equipment is being installed and several men are at work at the pit building the necessary shelters and making preparations for the installation of the remainder of the equipment. A huge gravel washer and dipper will be installed. The firm will furnish gravel for the construction of a concrete highway on state roads.

Muskingum River Gravel Co., Zanesville, Ohio, is constructing a new towboat for operation in the Muskingum river. The new boat, the first of two planned by the company, will be 80 ft. over all when completed, of paddle-wheel type, and will be powered by a 100-hp. Diesel motor. The new towboat is the second to be constructed for Muskingum river use. The first, the "Gravel King," was built in 1925 and is giving good service on the river.

The Sheridan Sand and Gravel Co., Sheridan, Ill. Work is progressing rapidly in the construction of the company's new $100,000 sand and gravel plant. More than 2000 ft. of new railroad tracks have been laid from the Burlington line at Sheridan to the new plant, located on the east side of the Fox river, about three-quarters of a mile southwest of the city. Foundations for the plant have been practically completed. The company, headed by L. A. Wilson of Ottawa, Ill., owns 78 acres of land along the river.

Cement

Giant Portland Cement Co., Philadelphia, Penn., is installing a 16 in. Bradley air separator.

Standard Portland Cement Co. announces the removal of its offices from 1741 Union Trust Bldg. to 925 Midland Bank Bldg., Cleveland, Ohio.

Nazareth Cement Co., Nazareth, Penn., is rebuilding its clinker grinding plant, including an installation of Bradley Hercules mills. The company also in installing three 14 in. Bradley air separators.

Georgia Cement and Products Co. has moved the Portland, Ga., and Birmingham, Ala., offices of the company to Atlanta, Ga., and consolidated the two offices in one central office at 820 Forsyth Bldg., Atlanta. The company's plant is at Portland, near Rockmart, Ga.

Lone Star Cement Co., Texas, has filed application for permits to erect two additions to its plant at Manchester, Tex. The additions will cost approximately $83,000. One will be 484 ft. long, 40 ft. wide and 65 ft. high, and the other will consist of two concrete silos, 30 ft. in diameter and 51 ft. high.

Ash Grove Lime and Portland Cement Co., Kansas City, Mo., has prepared a new series of folders designed to help dealers get some of the profitable small jobs in the community. The series consists of three folders so designed that they can be used as self-mailing pieces or as an enclosure with invoices, statements, etc. A place is provided on the back for the dealer's name if he desires it, but the company is emphasizing the use of reply cards in connection with the inserts, and instead of imprinting the dealer's name on the actual piece of advertising (unless he desires it) his name will be imprinted on a post card which will be inserted in the folder. The purpose of the card is to pull as many direct inquiries as possible, and thus give dealers immediate returns from their use of this advertising material. The subjects of the folders are "Hog Feeding Floors," "Dairy Barn Floors" and "How to Repair a Leaky Basement."

Cement Products

Wilson Brick and Tile Works of Red Oak and Des Moines, Ia., are planning a new branch of the company in the Northwest Iowa district. Spencer and Humboldt, Ia., are being considered as probable locations.

Concrete Conduit Co., Ltd., is completing work at its plant at Colton, Calif. The plant will manufacture conduit in sizes from 6-in. to 20-in. diameter, the average local requirement being about 12-in.

Fowler and Myers' concrete pipe plant at King City, Calif., has been completed and is now in operation. The company is also operating plants at San Fernando, Calif., and Somis, Calif. J. R. Clark is in charge of the King City plant.

The Perfection Stone Co. has leased the entire second floor of a large building at West Fifth and Sioux streets in Sioux City, Ia., for the manufacture of lawn benches, flower urns, bird baths and other concrete products.

Arnold Stone Co. of North Carolina, Inc., recently organized manufacturers of architectural cast-stone and concrete specialties, has established headquarters at 916 Warren St., Greensboro, N. C. M. A. Arnold is president and L. L. Krippner is vice-president and secretary.

Pacific Stone Co., Seattle, Wash., supplied its Romanite stone for use as a facing material in the construction of the new 17-story Rhodes Medical Arts Building. The Exchange Building and other Seattle buildings of recent construction have also been faced with this material.

Monessen Sand and Gravel Co.'s concrete block plant at Monessen, Penn., was destroyed by fire recently, with damages estimated at $5000. It is believed that the flames originated from a short circuit. Fortunately, the boiler in the block plant was open, allowing steam to escape, or an explosion would have occurred. According to John J. Kilroy, manager of the company, the plant will be rebuilt.

Miscellaneous Rock Products

Thermax Corp., Seattle, Wash., has issued a very attractive circular on Thermax wallboard, which is made by a scientific combination of rock and wood, the advantages of which are claimed to be struc-

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